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No DEPRESSION ALIBIS

Have held back the progress of I.B.M.'s Endicott shop toward its goal of 100 per cent in methods and equipment

An interview with WILLIAM W. GUMPRICH, manufacturing engineer, International Business Machines Corporation, by K. H. CONDIT

MANY OF US maintain glibly that we are striving to approach 100 per cent in our shop methods and equipment. But how many of us have embarked on a deliberate, carefully planned campaign to attain that objective?

Of course, the depression developed the finest crop of alibis for our failures that one can imagine. The worst of it is that most of these alibis are absolutely unshakable. Circumstances have been too much for many of us.

Up at the Endicott plant of International Business Machines, however, there have been no depression alibis, and there has been a determined effort to attain 100 per cent performance, both in modern machine tools and other manufacturing equipment, and in management methods. Now that the passing off of the depression is washing out most of the alibis mentioned, and we have a chance to resume the forward march toward perfection, the I.B.M. practice ought to be decidedly helpful.

Here's what I.B.M. has done to make its methods and equipment as efficient as possible:

1. Set up a division under the manufacturing engineer whose function is to recommend equipment purchases and improve machining and assembling.

2. Staffed this division with a group of men of known ability and wide experience.

3. Spent money for new equipment and tooling wherever reasonable savings could be shown.

4. Striven constantly to make the plant a better place to work in by seeking means of making operations easier to perform by provision of personal comforts such as air conditioning the entire shop, and by organizing training classes for all employees in preparation for advancement.

Upward Through the Depression

The intelligent sales policy of the company that looked for and created new markets for its products when the older began to fade, that put more salesmen to work, when others reduced their sales forces, has resulted in a sales curve that has moved steadily upward all through the depression. The funds have been available, therefore, to finance a progressive manufacturing policy, and what is more important, they have been used to carry out that policy.

Like so many other metal-working plants, the Endicott plant largely has the characteristics of a jobbing shop. It must be equipped to produce some 45,000 different parts and for that purpose it has 700 machine tools and other production machines. Approximately 3,800 people are employed in this plant.

A study of the company's product showed that, on the average, an I.B.M. machine part has a life of 3½ years before it is subject to design change. Obviously, therefore, new tools and fixtures are ordered on a basis of paying for themselves in not more than that time. The same limitation applies to machine tools of so special a nature that they will become obsolete if the design of the part for which they were bought is changed.

For machine tools in general a sliding scale applies. Each case is handled strictly on its merits. If the machine under consideration shows a reasonable likelihood of making an appreciable saving it is purchased. Because of the nature of the work and output demands, only a relatively short machine life can be expected of some tools. In such cases the new purchases must pay for themselves in a very short while; some pay out in less than two years. Others, such as milling machines and broaches, are granted a more liberl amortization period out of savings.

One or two fundamental requirements must be met in every purchase transaction. In the first place, since I.B.M. products are quality products, built to exacting standards of accuracy and finish, only first quality machine tools are considered. Secondly, whenever a machine is to be bought every machine known to the company, and which meets the first specification, is given consideration.

Machine tools bought according to the policy outlined have increased output considerably, often from three to ten times, during the past few years.

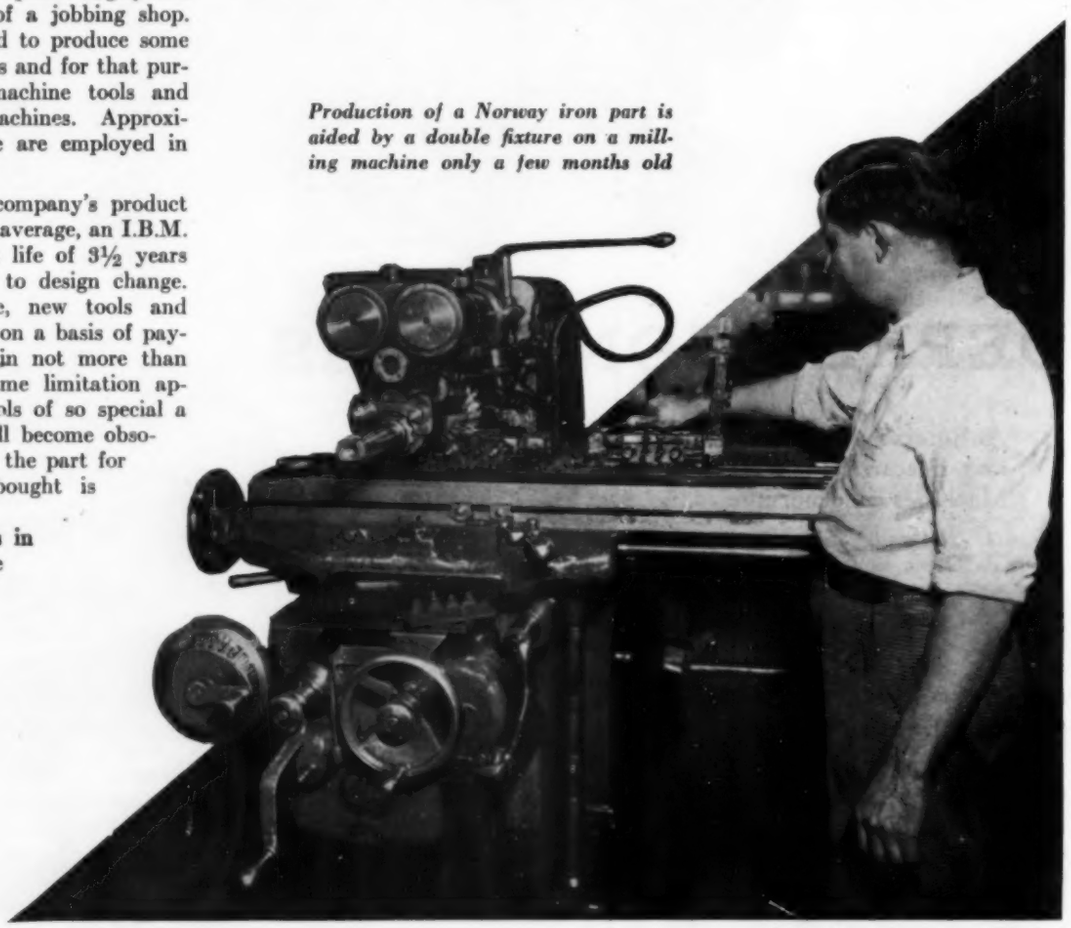
It is only fair to say, however, that part of this increase is attributable to a complete willingness to work machine and tool to the limit. This limit is generally considerably beyond what is considered reasonable in the average shop.

For instance, mild steel (SAE 1010 and 1020) is being cut at 150 ft. per min. with high-speed steel tools, and some cobalt high-speed steel. Feeds are as high as the job and the machine will stand, based on experience. This is the more remarkable in view of the close tolerances and high finish required.

Screw machine work to an accuracy of 0.001 in. is not unusual, and some jobs are held to 0.0005 in. One milling job consists of sawing 89 slots, 0.15625 in. apart, 0.062 in. wide and 0.343 in. plus or minus 0.0005 in. deep, in cold drawn steel SAE 1020 to a tolerance of 0.001 in. for every dimension but depth.

Supervision by Specialists

The system behind this campaign for maximum efficiency employs a group of process engineers who report to the manufacturing engineer. Each of these process engineers is a specialist in one or two production operations. For example, one concentrates on milling and drilling, another on



Production of a Norway iron part is aided by a double fixture on a milling machine only a few months old

Part of the supervisors' job is to instruct employees on the company's product and the methods used for making it

grinding, another on screw machine and turret lathe work, still another on punching and stamping. Two put their whole effort on special processes, while four devote their time to the unusually complicated assembling processes. The tool designers operate in a separate group, as do the tool analyzers, routing engineers and estimators.

The process engineers have two functions. When manufacturing or tooling analyses involving their specialties are being made they are called into consultation and contribute a good deal to the information on which the final decision is based. Their other job is to work continuously with the foremen, set-up men and operators engaged on operations falling within their respective fields.

In this latter field the first aim is to make the work as easy as possible for the operators. On one job, for instance, use of a particular coolant resulted in a small increase in production but also softened the operator's hands so there was too much danger of cuts from the sharp chips. As a consequence the operation was returned to the old coolant. As a matter of strictest policy, every conceivable safeguard is provided to protect body and health of the machine operators.

The other aim of the process engineer is to improve the method used for each operation, as well as the machine and the tooling, until it approaches the maximum obtainable with reasonable tool life.

Obviously, the process engineers are selected not only for their knowledge and experience in technical matters, but also for their tact and ability to sell their ideas to the men with whom they have to work, both among the shop executives and the operators. It speaks volumes for their ability along this line that there has not been any contention since these men began their work over 15 months ago.

The system governing this work is that every case must be judged on its merits. The first standard to be satisfied is that of common sense. Rules there are, but for guidance rather than for foolishly rigid observance. Because nothing tends to create more wastefulness and laziness than to use the rules as a refuge from thinking.

A secondary responsibility of the process engineers is to lecture on their specialties and conduct classes in them for the operators who want to learn more about their work so that their earnings may increase. The quite unusual facilities of the I.B.M. school building make it relatively easy to conduct these classes, and the attendance at them is considerable.

Needless to say the accomplishment of results in such surroundings and under policies so forward looking is not a difficult job. Why shouldn't both the surroundings and the policies be in evidence in other plants more often?

Castings for Machine Tools

Time was when castings for American machine tools were criticized in some foreign countries for being too soft. This was given as the reason for the higher planing speeds in this country. Now, however, machine tool bed castings are made with high test nickel and manganese alloy, and the machining is not as easy as formerly.

It has taken long practice and great care to increase the wearing qualities to the present stage and at the same time retain the necessary machining qualities. In the Sterling Foundry in Wellington, Ohio, for example, there is a test block cast on every lathe bed, so located as to represent a critical section of the completed casting. This block has a serial number and the date cast on it. The block is fractured and the hardness measured by Brinell, both the fracture and hardness forming a permanent record.

These lathe castings are rough ground on surfaces that are not to be machined, given an undercoat of paint, smoothed with a quick drying filler, and then painted before they leave the foundry.

Some idea of the results of extreme care in the foundry can be had from the scrap record for 1934. Foundry scrap was 2½ per cent, and rejects at the plant were ½ per cent. And still some foundries have difficulty in satisfying machine tool customers!

FIRST CLASS

Concentration in their work reflects the keen appreciation these boys have for an opportunity to learn a trade

Just graduated, the boys who a year and a half ago started in Norton's new course for specialized apprentice training are now capable of first class work

DONALD TULLOCH

ANY TRAINING plan that meets with the enthusiastic approval of the trainer and the trainee alike can be considered a success. Just that has been the experience with the first class of special apprentices in the training plan originated in the plant of the Norton Company by Manager Howard Dunbar a year and a half ago. Details of the plan were given in an article by Mr. Dunbar (*AM*—Vol. 78, page 725). Here is the experience with the first class.

This training course comprises a period of eighteen months, during which the boys receive education in mechanics on all the common machine tools, and at classroom lectures on subjects pertaining to machine work, the ultimate object being to make them specialists.

Who is selected to work out this plan? What are the characteristics required in a prospective skilled machinist? First of all, the boy's desire to become a skilled workman; second, his physical make-up; third, his early education; fourth, his heritage; fifth, his close residential proximity to the plant to save his time and carfare. Naturally, the Norton Company endeavors to favor the son of an employee. But no partiality is shown so far as nativity is concerned. In fact, there has been such a variety of nationalities in birth or parentage in this first group, that it has been dubbed "The League of Nations Class."

Who selects the boys? A committee consisting of the manager, sales manager, chief engineer, production engineer, superintendent, general foreman and equipment engineer.

What do the apprentices work at? A brief run through the extensive shops showed that there are a couple of boys in the grinding department, both of them operating machines daily on a common job. There is one on the drills, two on planers, one each on turret lathes, hand screw machines, engine lathes, millers, toolmaking, in the experimental department, two on the erecting floor and one on assembling.

That the boys have made good is indicated by the voluntary statement of the foreman of the horizontal boring department who has been in charge there for well nigh 30 years, when he said, "Those boys, after a year's training, are as good as the average boring mill hand you can hire."

The ages of the boys range from 18 to 22 years, and they are, for the most part, taken from the high or boys' trades schools. They start work at a nominal rate of pay, and are advanced periodically until, at the completion of the course, they are receiving the standard rates of pay for the particular work they are doing. The superintendent said: "We expect them to take their places and measure up to a better standard than that of the ordinary workman, because of this intensive training."

They work eight hours per day, five days a week. They attend our school one hour a day for the necessary aca-

demic training. They study that side of mechanics which includes blueprint reading, making blueprints, use of the common measuring tools of an up-to-date machine shop. They are trained in mathematics, algebra, trigonometry, metric measurements, ratio, proportion and percentage. In addition, they listen to lectures by the key men of the Norton Company on shop practice and inspection methods.

When I was escorted through a portion of the plant, I stood right where a dozen of "The League" were industriously pursuing drafting problems on their individual boards. While some audible talk was going on with the superintendent and the foreman in charge of that particular part of the training course, I was struck with the fact that not a single boy raised his head from his task to find out what was going on beside him, as is usually the case under such conditions. And I was so struck with their earnestness and devotion to the work in hand that I concluded that here was real concentration.

Then a trip was made to the various other departments where the boys put in their daily work. I could not discern any difference between them and the rank and file of the workmen who have earned gold badges for a quarter century's loyal and efficient service in this company's employ. The boys are earnest students, careful in their work at the machines and diligent in their studies in the classroom.

Results That Count

The suggestion may be made that this new plan is just a recurrence of the specialist training of a score of years ago. Yes, partly true. But in this particular case it is an intensive schedule of a more thorough, personal training by experienced, sympathetic teachers, touching the receptive minds of selected youth and covering a shorter period of education, with success all around in the matter of supplying the needed help to the manufacturer and worthy employment to worthy young America.

Well, then, what are the immediate results?

1. Much satisfaction to the employer, to the apprentice employee, to his foreman, and to the various workers associated with the young employee in his room.

2. What are the reasons for this satisfaction? The caliber of the boys reflects credit on the selecting committee who show keen interest in the progress of the squad.

3. The education is specific and practical. The boys evince a desire to perform conscientious work.

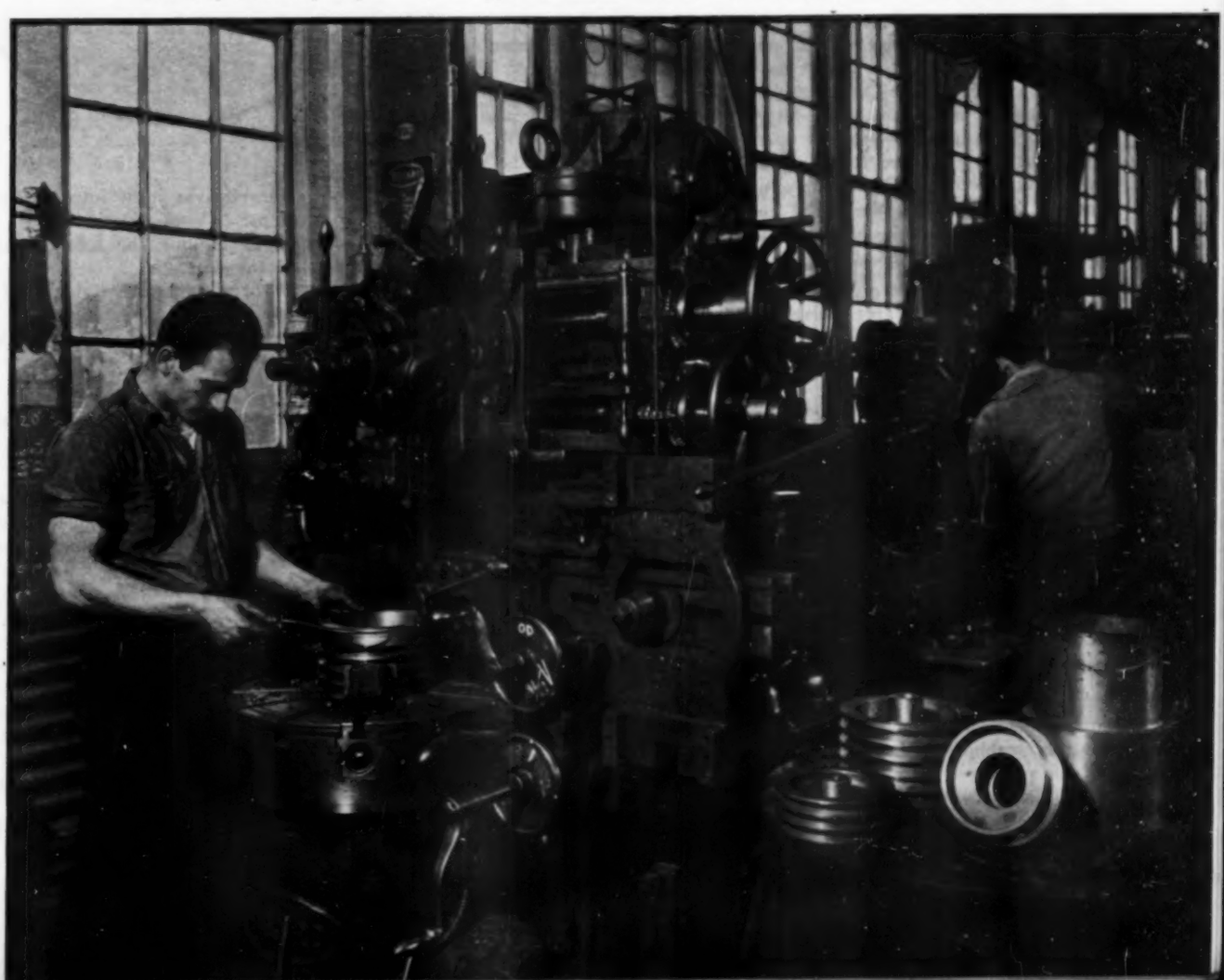
4. The company places confidence in the boys' ability, after a brief schooling, to handle even the most costly machine tool.

5. A very reasonable amount of production; a comparatively small spoilage of work.

6. The boy is satisfied that he has attained the standard of a man of earning capacity in being able to operate a machine. He takes especial pride in witnessing his own production of a piece of mechanism that is marketable as well as a thing of beauty.

These are the results from the first class. Other classes are now on their way through the course. Careful selection of the boys accepted for the course and close concentration throughout its duration are fundamental. Other companies facing the same problem of shortage of skilled operators might well adopt similar plans to overcome it.

Proud of his ability to produce, the apprentice turns out V-belt pulleys for the Norton grinding machine



WHAT SIZE BLANK?

L. P. Sittig

Some designers draw a blank if asked to figure blank size for drawn work. But it's not so hard if the shape is reduced to its elements

MOST formulas for figuring blank diameters for drawing operations on sheet metal products seem to express the author's facility with algebra, without enlightening the reader as to the "how and why" of figuring blank diameters. Furthermore, little attention has been paid to drawing operations for shapes other than circular, which are becoming increasingly numerous, especially in the metal container field, and for the covers of mechanical and electrical units.

Perhaps 90 per cent of the tool designers in America are not college trained and, therefore, lengthy algebraic expressions are avoided in the formulas given below. The analysis of areas is made clear, so that a blank area is seen as the equivalent of the combined areas of the several fundamental geometrical figures composing the part.

Sheet-metal drawing operations may be grouped into two classes:

1. Those of uniform wall thickness throughout.

2. Those where the side walls are stretched thinner than the bottom.

For parts of the first class, the area of the blank required will be the same as the combined areas of each surface of the part, were it laid out flat. For instance, the area of the circular blank needed to draw a plain cylindrical shell will be the same as the combined areas of the tube composing the sides, the disk composing the bottom and the area of metal needed to fill in the bottom corner. Parts of the second class require that the volume be calculated because of the difference in thickness of the sides and the bottom.

In either case, the volumes of the blank and the finished shell must be the same. Since volume equals area times thickness, it is obvious that with a uniform thickness throughout, the areas are equivalent and likewise the volumes.

In speaking of blank areas, no allowance has been figured for trimming the edges of a drawing job. An amount can be added to the diameter of the blank, dependent upon the method of trimming used, whether by a die or rotary trimming machine. For a part having straight sides, such as a cylindrical shell, the edges when trimmed in a die will appear as in Fig. 2. Where the edges are trimmed in a rotary trimming machine, they will be sheared square with the sides.

For shells of uniform wall thickness, the problem of finding the blank diameter resolves itself into the following steps:

(*a*) Finding the total surface area of the part.

(*b*) Finding the shape of blank required.

(*c*) Finding the size of blank in the required shape.

In Fig. 1 are shown shapes of surfaces composing the bottom and side walls of every kind of drawn shell in common use.

Several problems involving the computation of blank diameters will best illustrate the use of these figures. For example, the cylindrical shell with a sharp inside corner, shown in Fig. 3, is found to be a combination of geometrical figures 8, 14, and 17, in Fig. 1, in other words, the combined areas of the circular disk comprising the bottom, the tubular section comprising the wall, and the area necessary to allow for the metal in the bottom corner. The last named factor is fre-

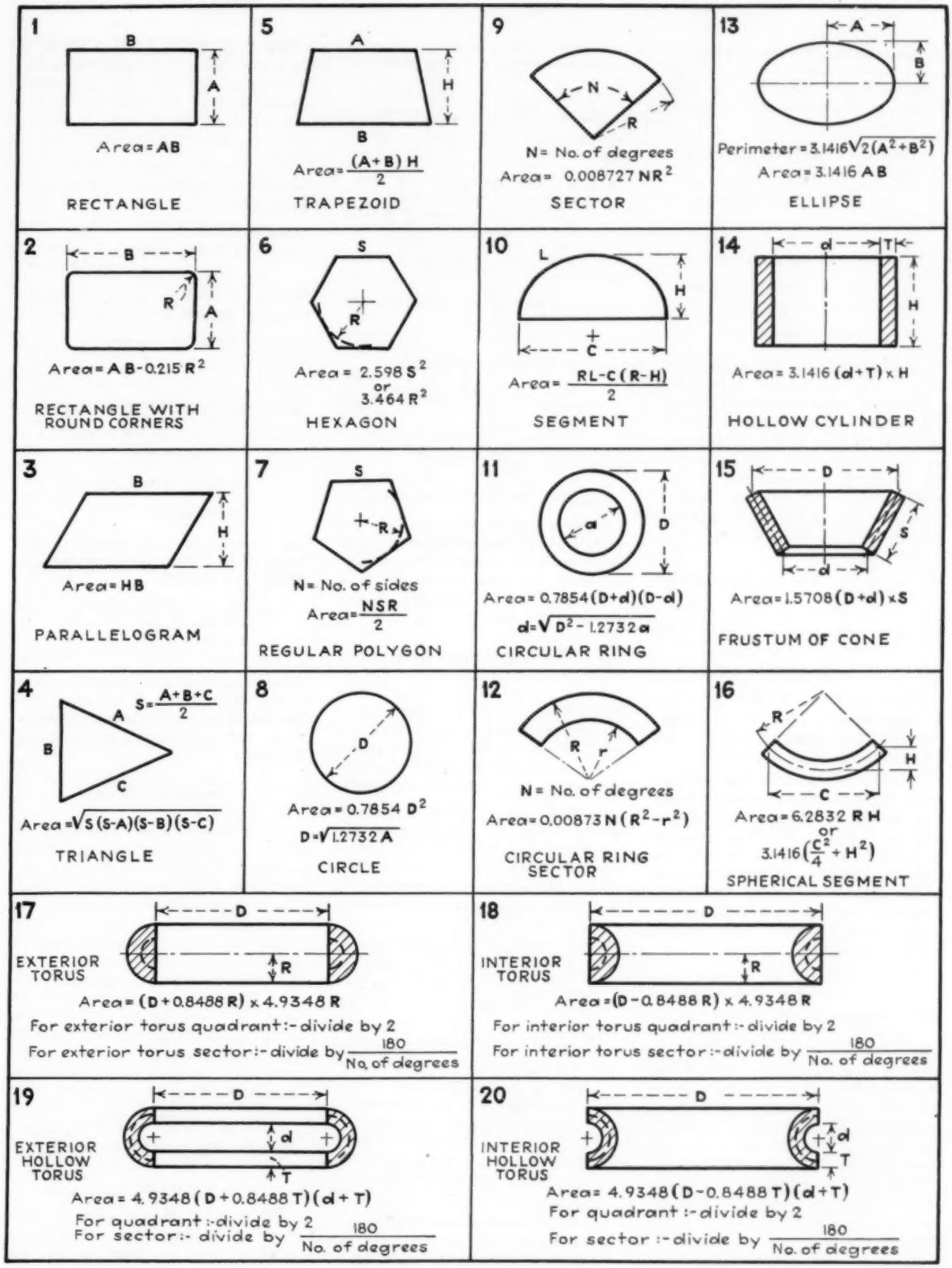


Fig. 1—Areas for common geometrical shapes will help in calculating blanks for drawn shells. If the shell walls are thinner than the bottom, volume of metal must be figured

quently neglected in careless computations of shell areas.

Assuming dimensions for this shell as in Fig. 4, the areas would be figured as follows:

For the circular bottom, according to formula 8

$$\text{Area} = 0.7854\ D^2 = 0.6013 \text{ sq.in.}$$

For the tubular wall, according to formula 14

$$\text{Area} = 3.1416(d + T) \times H = 1.3744 \text{ sq.in.}$$

For the bottom corner, according to formula 17

$$\text{Area} = \frac{(D + 0.8488\ R) \times 4.9348\ R}{2} = 0.3025 \text{ sq.in.}$$

Add Trimming Allowance

The total is the sum of these three areas, or 2.2782 sq.in. Since the shape of blank for this shell will obviously be circular, the next step is to find the diameter corresponding to the above area. If in formula 8, area $= 0.7854\ D^2$, we find by transposing the factors of this equation, that $D = \sqrt{\frac{A}{0.7854}}$. This may be simplified further, since 0.7854 is $\frac{3.1416}{4}$, by writing it $D = \sqrt{1.2732\ A}$. Applying this, we find that $D = \sqrt{2.9006} = 1.703$, or approximately 1¾. To this diameter should be added an allowance for trimming.

In order to analyze the different areas comprising the surface of the shell in Fig. 7, let us assume dimensions as in Fig. 5. It is first necessary to find dimension S, which is not known. By making an enlarged sketch of the tapered sides as in Fig. 6, this dimension can be computed by the triangles shown in dotted lines. In the small triangle ABC we have

$$AC = BC \times \tan 20 \text{ deg.} = 0.1875 \times 0.36397 = 0.0682 \text{ in.}$$

In the large triangle DAF we have

$$AD = DF \times \sec 20 \text{ deg.} = 0.375 \times 1.0642 = 0.399 \text{ in.}$$

Adding these dimensions, we find that $S = 0.4672$. Then we may analyze this shell as a combination of the three geometrical figures indicated in Fig. 7. In order to use formula 15 for the conic frustum which forms the wall of the shell, we must first find the dimensions D and d. From the triangles indicated in Fig. 8, these are found as follows:

$$D = AB + 2BC + 2CD + 1\tfrac{1}{2}$$
$$= \tfrac{1}{16} \cos 20 \text{ deg.} + 2 \times \tfrac{3}{8} \tan 20 \text{ deg.} + 2 \times \tfrac{3}{16} \sec 20 \text{ deg.} + 1.5$$
$$= 2.2305$$

$$d = FG + 2GH + 1.5$$
$$= \tfrac{1}{16} \cos 20 \text{ deg.} + 2 \times \tfrac{3}{16} \cos 20 \text{ deg.} + 1.5$$
$$= 1.9109$$

Then by applying formula 15 we find that area for the frustum of the cone is:

$$\text{Area} = 1.5708\ (D + d)\ S = 1.5708\ (2.2305 + 1.9109)\ 0.4672 = 3.088 \text{ sq.in.}$$

Applying formula 19 for the rounded bottom corner, we find that

$$\text{Area} = 4.9348\ (D + 0.8488T)\ (d + T) \times \frac{N}{180}$$
$$= 4.9348\ (1.5 + 0.8488 \times 0.0625)\ (.375 + .0625) \times \frac{70}{180}$$
$$= 1.303 \text{ sq.in.}$$

Applying formula 8 for the circular bottom, we have

$$\text{Area} = 0.7854\ D^2 = 1.767 \text{ sq.in.}$$

Combining these three areas, we find that the total area of blank is 6.158 sq.in. Since the blank will be circular in shape, this area corresponds to a diameter of 2.810, exclusive of any allowance for trimming the edge.

Take Quadrant Only

In Fig. 9 is shown a flanged shell which is seen to be a combination of geometrical figures 11, 18, 14, 19, and 8. Care must be taken when applying formulas 18 and 19 to see that the areas of the quadrant only are taken.

A shell with a spherical bulge is shown in Fig. 10. Assuming for this the dimensions shown in Fig. 11, we may use the analysis suggested for this shape. However it will be necessary to first find a few more dimensions before applying the formulas shown. To find the radius of the spherical contour, we can draw a dotted line between the centers of the ¼-in. radii, and then make use of the proportion

$$\text{Height of segment} \Big/ \tfrac{1}{2} \text{ chord} = \tfrac{1}{2} \text{ chord} \Big/ \text{Diameter height of segment}$$

$$\text{or } H \Big/ \frac{c}{2} = \frac{c}{2} \Big/ D - H$$

In this case $1\tfrac{1}{4} / 2\tfrac{1}{2} = 2\tfrac{1}{2} / D - 1\tfrac{1}{4}$

$\frac{(2\frac{1}{2})^2}{1\frac{1}{4}} = 5$, then $D = 5 + 1\tfrac{1}{4} = 6.250$ in.

$\frac{6.25 - \frac{1}{2}}{2} = 2\tfrac{7}{8}$ in., outside radius

To find the angle of arc embraced by this spherical segment, we have $\frac{2.5}{3.125} = 0.8000 = \sin. 53° 8'$, which is one-half the angle. In order to apply formula 16 we must first find the dimensions required for this. R would be $2.875 - .010 = 2.865$ in. H will be $R - (R \times \cos. 53° 8') = 1.146$ in.

Then for the spherical bottom of this shell we find the area by formula 16 as follows:

$$\text{Area} = 6.2832\ R\ H$$
$$\text{Area} = 6.2832 \times 2.865 \times 1.146 = 20.629 \text{ sq.in.}$$

For the rounded corner of the flange, we apply formula 20 and find that:

$$\text{Area} = 4.9348\ (D - 0.8488T)\ (d + T) \times \frac{N}{180}$$
$$\text{Area} = 4.9348\ (5 - 0.8488 \times 0.020)\ (0.5 + 0.020) \times \frac{53}{180}$$
$$= 4.9348 \times 4.9831 \times 0.520 \times \frac{53}{180}$$
$$= 3.765 \text{ sq.in.}$$

For the circular ring composing the flange of this shell, we apply formula 11 and find that:

$$\text{Area} = 0.7854\ (D + d)\ (D - d)$$
$$= 0.7854\ (7 + 5)\ (7 - 5)$$
$$= 0.7854 \times 12 \times 2 = 18.849 \text{ sq in.}$$

Combining these three areas we have 43.243 sq.in., which is the area of a circular blank whose diameter is found to be 8.157, exclusive of any trimming allowance.

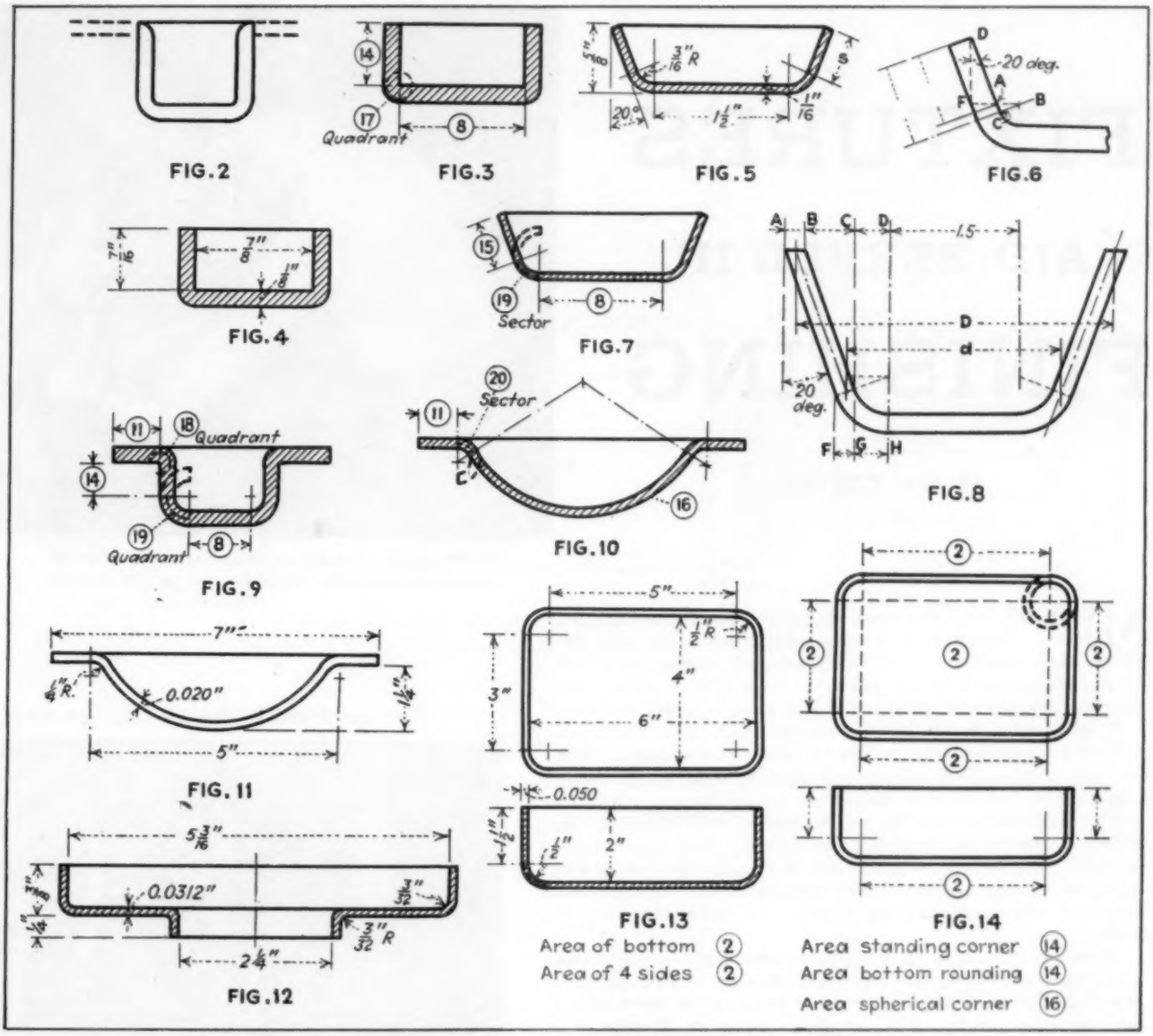
An Inside Draw

For a shell with an inside draw, as in Fig. 12, the blank diameter is found as before explained, assuming that the bottom is a flat disk without a hole. The diameter of hole required for the inside draw may be found by first computing the area of metal composing the geometrical elements 20 and 14 of the drawn hub on this shell. We find the combined area to be 1.335 sq.in. This will be the area of a circular ring or 2½ in. diameter. To find the diameter of the hole in this circular ring, we apply the formula from geometrical figure 11:

$$d = \sqrt{D^2 - 1.2732A}$$

Since $D = 2\tfrac{1}{2}$, we find that $d = \sqrt{(2\frac{1}{2})^2 - 1.2732 \times 1.335} = 2.133$ in.

Rectangular shapes offer a more complex problem. Let us assume a shell or cover as shown in Fig. 13. Calculating the area by following the analysis suggested in Fig. 14, we find the summation of areas composing the



Figs. 2 to 14—Applied to typical shells, the method of dividing areas is demonstrated

various geometrical elements to be as follows:

Area of flat bottom = $3 \times 5 = 15$ sq.in.

Area of 4 sides = $5 \times 1\frac{1}{2}$, $5 \times 1\frac{1}{2}$, $3 \times 1\frac{1}{2}$, $3 \times 1\frac{1}{2}$ = 24 sq.in.

Area of standing corner = $3.1416 \times 1.050 \times 1\frac{1}{2}$ = 4.948 sq.in.

Area of bottom rounding = $0.525 \times 1.5708 \times 16$ = 13.195 sq.in.

Area of spherical corner = $6.2832\,RH$ = 1.732 sq.in.

Total area = 58.875 sq.in.

The shape of this blank will obviously be a rectangle with rounded corners. The over-all dimensions of the rectangle will correspond closely to the developed lengths of cross-sections taken on the centerlines or axes of the part. A cross-section on the long axis would be figured as $2 \times 1\frac{1}{2} + 5 + 2 \times 0.525 \times 1.5708 = 9.649$ in. The developed length of the short axis would be 2 in. shorter, or 7.649 in. A rectangle of these dimensions would require a substantial radius at the corners so that its area would be reduced to equal the area of the blank needed. Since the area of a rectangle of the above dimensions is 73.805 sq.in., and the required blank area is 58.875 sq.in., the difference between these figures would be the surplus material to be removed from the corners, or one-quarter of this amount for each corner. If 3.732 sq.in. represents the area of corner to be removed from the blank, we may find the radius needed for this by the formula $R = \sqrt{4.66\,A}$. Applying this formula to the above figure, we obtain a radius of 4.170 in.

In reality this radius would not be satisfactory, because it allows too much metal just at the corner and would not allow enough at points just beyond the corner. The shape as developed by a little experimenting on the part of the toolmaker would be one with a slightly flattened arc at the corners. By using blanks for experimental draws with lines scribed over them, making squares ½ in. each way, the flow of metal during the drawing operation can be readily seen, and proper allowances made in the blank shape.

FIXTURES AID SERVEL IN FINISHING

FRED H. COLVIN
Editor

Grinding is the first step in preparing a steel absorber cylinder for soldering a copper coil on the exterior

METHODS, like men, must give way when better ones are found. Economy or the desire for better work may dictate a change from one set of widely accepted practices to others particularly adapted to the product. As a case in point, consider the procedure for attaching a copper coil to a steel cylinder.

At the plant of Servel, Inc., the absorber unit of the Electrolux refrigerator was formerly sandblasted and metal sprayed. Now the part is ground on a floorstand grinder, metal sprayed with zinc and the copper coil is soldered to the cylinder by gas torch.

A special fixture was made for holding and revolving the absorber cylinder while grinding the surface. The work is taken between cone centers, and the fixture is suspended on a wire rope passing over a sheave. The operator moves the tube back and forth against the grinding wheel, a few passes removing the scale.

Details of the design of this tube holder for the grinding operation are shown in an accompanying drawing. The absorber is placed in the cones *A* and *B*, cone *B* being moved by handle *C* and the small crank and linkage shown below it. Handles *D* at each end are for holding the work against the wheel.

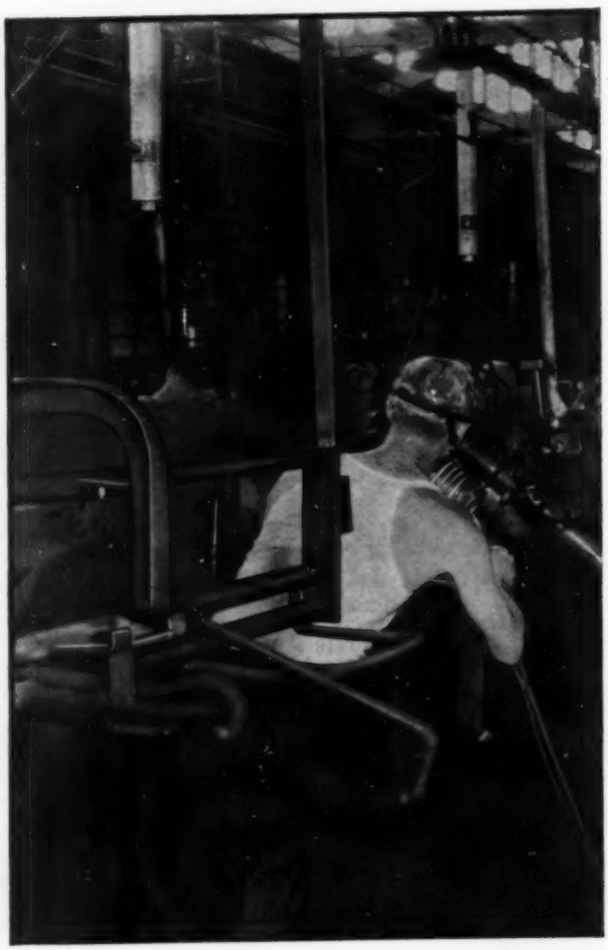
Both cones revolve against a single ball for a thrust bearing. Both cone spindles have felt washers to retain the lubricant. A Zerk fitting in each cone permits lubricant to be forced to the bearing surfaces. Small variations in the length of the absorber are taken care of by a coil spring inside cone *B*. Motion of the spring is limited by the flanged collar at the back of the cone.

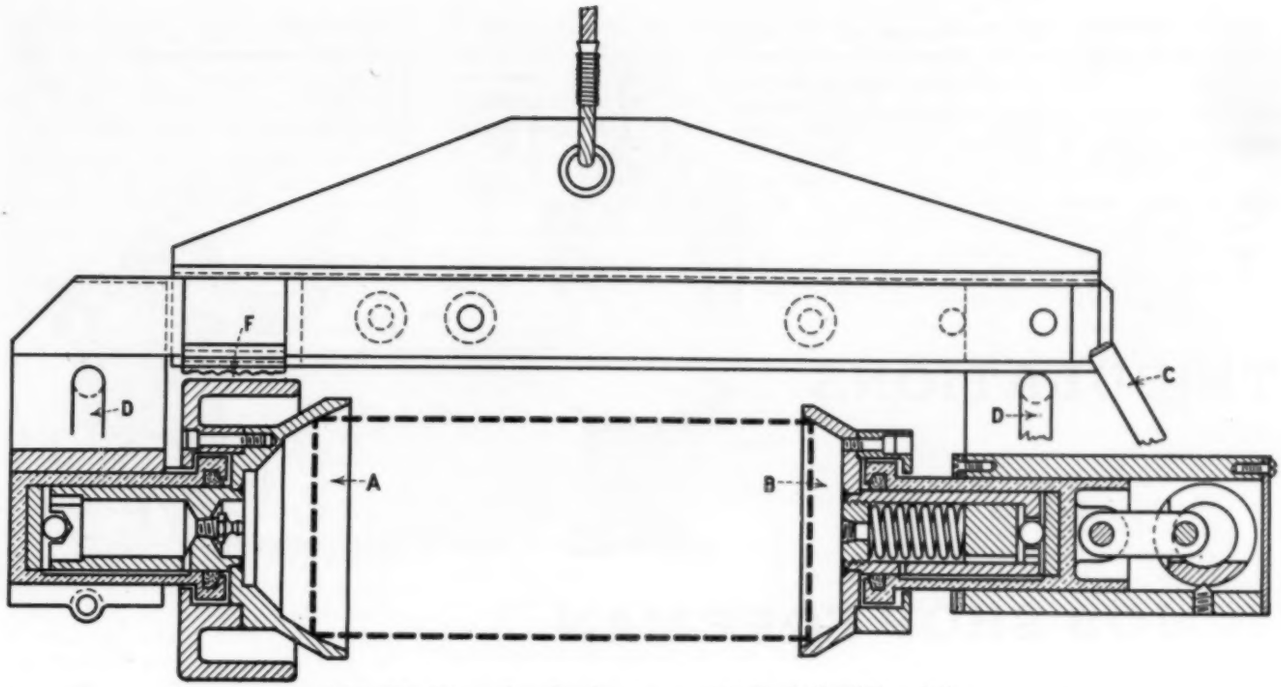
Rotation of the work by wheel contact is controlled by a brake shoe at *F*. This covers about one quarter of the circumference of the brake pulley at the back of cone *A*. Brake pressure can be adjusted to suit conditions.

At the metal-spray station, the ground absorber tubes slide down a chute at the right of the operator. He picks them off one at a time, placing one on a vertical revolving spindle that resembles the potter's wheel. As the tube rotates, he coats it with zinc by means of a hand-type metal spray gun. The part is now ready for soldering the copper coil in place.

When the absorbers reach the soldering department they are placed on fixtures in a conveyor line. The copper coil is placed over the absorber and soldered with a gas torch as the conveyor moves. Gas and air come to the torch in the long hose shown. These allow the operator to move freely and to complete the job despite conveyor motion.

Zinc-sprayed absorber cylinders go to an assembly





With this fixture the absorber is conveniently held while grinding. A brake maintains proper relative speed of work and wheel

line where the coil is soldered in place by gas torch

Grinding, metal-spraying and soldering the new Electrolux refrigerator is speeded by the use of carefully conceived holding devices

This man is not a potter putting glaze on porcelain but a metal-spray operator applying zinc to a steel cylinder

You can tell the editor that there's enough tribulations hanging on a foreman's neck to fill a book

TRIBULATIONS of a JOB SHOP FOREMAN

CHARLES WESLOW

IN THE jobbing shop where I work these days I had our foreman, Mac, read my article "Job Shop Days" (*AM*—Vol. 79, page 584). In due time he returned it, with a request that I throw an impartial article in *American Machinist* entitled "Tribulations of a Job Shop Foreman." I promised him I would try, if he would give me some hints on what to write according to his own fourteen years experience as a foreman.

"You can tell the editor of that illustrious magazine," said Mac, "that there's enough tribulations hanging on a foreman's neck to fill a book. Here's one. A die job comes in from a manufacturing concern which gives us no shut height of the press it's to work in. All they could give us, was the information that the press was a Bliss 14, that they couldn't stop the press because it was busy. They are in a hurry for the die, yet they are too busy to give us the required measurements about the press."

I asked Mac if he had a Bliss catalog, and he answered in the negative. I added that it was next to impossible to take in die work without catalogs of all presses which give the stroke and shut height, as well as the thickness of a standard bolster.

If I use a word in an article that is not understood by a certain reader, is that reader going to write to the Information Bureau at Washington for the meaning of it, just because he has no dictionary, which is just as essential as to have in one's home or office, as a Bible?

There was many a time in my life, when as the quitting whistle blew, the foreman or boss came to me to tell me that he had no more work for me. Only last winter I was employed in a building which had two jobbing shops on the same floor; the boss of each shop knew the other intimately. I was laid off in one and slid my tool box right over to the other shop. After several weeks work in the latter shop, I was laid off, but sliding my box back again was "out," because a man had been hired there the day previous. Couldn't the latter boss have put the former boss wise that I was about to be laid off and give the former boss notice to hold a job open for me?

Those are the tribulations of a toolmaker. On account of that episode, I found myself out of work for almost two weeks, and then had to cart my tool box elsewhere, whereas, I could have stayed in that building indefinitely, considering that my work and conduct were satisfactory.

I have seen foremen overburdened with "tribulations," yet they have been observed showing some apprentice how to saw off a board with a hacksaw or how to sharpen a twist drill. A boy can learn the art of sawing wood or edging a drill without the foreman horning in on the subject. Is it a foreman's duty to teach apprentices various subjects, and turn his valued attention away from other vital matters thus giving himself unwarranted tribulations?

A Job Ahead Always

In a large jobbing shop where I once worked, the foreman had a table, 4 ft. wide and about 15 ft. long, on which he kept steel and cast iron parts of a new job ready for toolmakers who ran out of a job. Each man knew where he would find a new job for himself, because each man had a place on that table.

If the man was uncertain about anything, he would take the blueprint or sketch of the job to the foreman sitting at the desk for the desired instructions and go on to his bench like nobody's business. Each piece of steel or iron was chalk marked the number of the part of the job, and those pieces were handed over to the shaper lathe or milling machine hand by the toolmaker whose duty it was to enlist that job as his own; in due time was handed back to him by all the hands referred to. There was a foreman who had no tribulations.

Some foremen seem to think that it is their sacred duty to go around the shop asking every man "How's this coming along?" or "How soon will you

get this done?" Such a foreman has the leadership of a minor. The old "gag," why men leave home is no older than why toolmakers chuck their jobs. I have chucked jobs for ones that paid less money just to get away from a pest of a foreman. I'd much rather work in a place where the equipment is poor, but the foreman a prince, than in a place where the equipment is excellent with a pest or snob of a foreman.

Talking Out of Turn

In the War, I was doing secret service in toolrooms throughout several eastern states. I applied for and got a job in the Wright-Martin airplane plant in Long Island. After a couple of weeks there, the foreman fired me on account of talking. As I reached the office for my pay, I was met by an old friend, who had been a bench mate of mine in a shop some years before the War. He was surprised to see me checking out, not even knowing that I had been employed in the toolroom. He asked where I was going, and I answered merely that I was going to look for another job. Quizzing me again he asked, "What's the trouble Charlie?" I said, "Oh, just got fired, that's all."

"For what?" he asked in surprise, knowing my conduct and work had been always good. "For talking," I retorted.

He knew by previous experience that I had been zealous in my interest in apprentice boys and asked me if I was teaching a boy something, and I said "Yes." Then he busted a bean bag by asking me if I knew his position in the plant, and I assured him that I didn't and that in fact I was surprised to meet him in the office. Immediately he hollered to the cashier to hold my pay and told the 'phone girl to request the toolroom foreman to come to his office immediately.

He came as soon as the elevator could lower him down from the upper floor. Said my old friend to the toolroom foreman, "Did you discharge this man?" The foreman replied in the affirmative.

"Why?" asked my friend. "For talking too much," retorted the foreman. "Did you find out what he was talking about?" "No I didn't, because he seemed to be bent on talking his way out of a job, so I decided to help him," answered the brave executive.

That is when the old friend revealed to me the position he held in the plant, by saying to that low brow, "I happen to know this man a long while, and I want you to know that he didn't talk himself out of a job, but talked himself right into yours." With that the foreman shook hands in the opposite direction. Had that foreman been retained on his job much longer, he would have been so overburdened with tribulations that he'd been a fit subject for a bug house.

I worked as foreman from that day on for four weeks and then showed my friend why I was employed there and secured for him a better foreman than I could ever hope to be. Was that a tribulation for my friend to bear? My report to Washington was, "Poor foreman discharged, replaced by a good one. Superintendent O.K."

In my opinion self-made foremen never were any good. A man gets to be a good foreman if he is taught and trained for the position. I was foreman in several places in my earlier youth, but I never made a good foreman for just that reason—not trained. I was trained to become a toolmaker, but no one ever gave me any tips on how to become a foreman. I wrote articles for this magazine in the years 1909 and 1910 and showed some to a superintendent in a place where I worked, who promptly appointed me the new foreman of his toolroom. But after a month I was a failure, quit, went to work in another place as a lathe hand and was happy.

I felt tribulations coming my way, due mostly to my interest in toolmaking instead of in foremanship, so I chucked up the job.

The worst tribulation a toolmaker has to bear is when he spoils some part of a job and right away starts to think where he will look for another job if the foreman fires him.

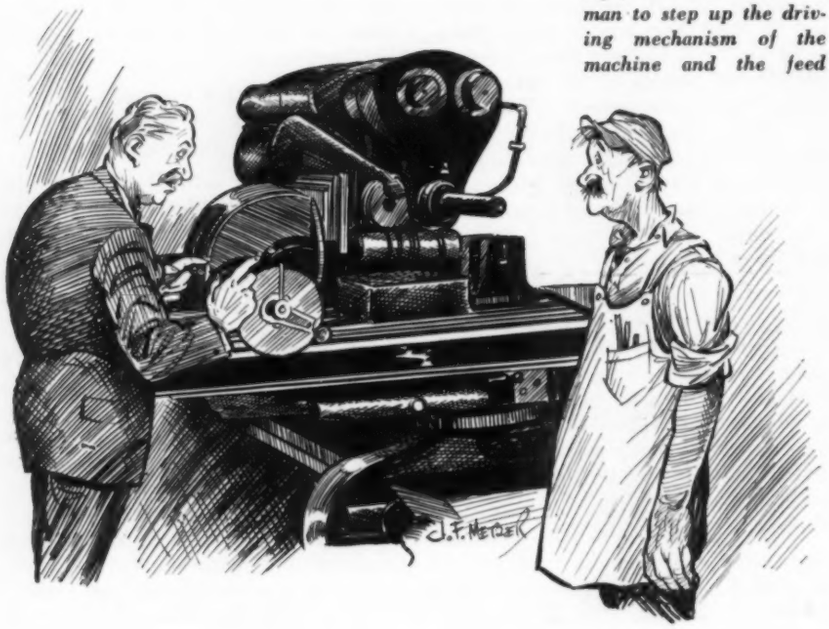
Speaking from a foreman's point of view again, let us ponder over the tribulations of a job shop foreman.

The boss, or outside man, or the mail, brings some blueprints and maybe a sample. Consider the job shop one in which no tool designer or draftsman is employed, these duties being bestowed on the foreman. Thus the blueprints are turned over to the foreman, who often is obliged to carry them home with him to study out in his spare time (home work). There he makes sketches of the tools necessary to meet the requirements of the blueprints and figures, according to his experience as a toolmaker, how long it will take to make the tools he has sketched out according to the equipment he has to work with. He makes a guess as to what material is in stock in the shop; knowing that his stock is not full of all kinds and all sizes, he adds another ten per cent onto the cost.

I slid my toolbox right over to the other shop

He arrives in the morning with the necessary quotation, which is made known to the customer. And we will suppose that the job is captured.

The start, and that incidentally is the most difficult part of the job, is to hand the job over to a toolmaker who is qualified to execute it from start to finish. The toolmaker then writes down the sizes of all the steel parts he needs for it and turns that over to the boy or man who attends to the sawing off process. Then that toolmaker hands the various parts to the machine hands. The foreman all the while is busy figuring on another job



Some foremen will butt right in and tell the man to step up the driving mechanism of the machine and the feed

and busy answering 'phone inquiries concerning jobs en route.

Eventually the toolmaker is having the shaper hand make a block say ¾ in. square out of tool steel from a block 1x1½x1¾ in. Along comes the foreman and accidently notices the big block of steel being cut to size by the shaper hand and inquiries what it is for. After learning the truth he goes to the toolmaker and bawls him out for using such oversize steel, and the toolmaker claims he couldn't find anything else. Then the foreman bawls again, "Why didn't you ask? There's a bar of steel 1-in. square under my desk you could have had."

There's a tribulation on the foreman's neck. Now on the other hand, why was that bar of steel under his desk instead of on the rack where all steel is expected to be kept?

Half Speed

A milling machine hand may be taking a cut off some part of that job when the foreman spies him running at too slow a speed and too slow a feed, thus eating up time the foreman never figured on. The foreman hates to interfere with that man's method, but there he stands vexed at seeing the machine doing half the work it could do. Some foremen will butt right in and tell the man to step up the driving mechanism of the machine and the feed, knowing all the while that there are plenty of teeth on the cutter to take care of the double duty. Why are some foremen afraid to instruct men that way? Don't be afraid—the men are not going to bite you. If Henry Ford found out that any of his foremen were afraid like that, he would throw them out.

Part of the Job

A foreman's duty is not only handing out work to his men to do but seeing that he gets the most work out of them. He isn't attending to his foremanship if he stands there just "looking." Some men will use a cutter that is entirely too small for the job, and it is the foreman's duty to tell the man to change over to a cutter that will rip off the material in jig time. The man may be using the small cutter because the larger cutters may be too dull.

Whose fault is it that the large cutters are dull? It's the duty of the foreman to bawl out the one whose duty it is to see that all cutters are kept sharp. And if cutters are worn out or broken, he must see that the one whose duty it is to report such a condition must attend to it or get demoted.

I can often trace the tribulations of a foreman to himself. I worked in a manufacturing concern where the foreman never gave a thought of designing a tool. He left that to the toolmakers to do, who in turn submitted their ideas to him. That foreman got along with his men like a chef gets along with kids in a kindergarten.

Personally, I say it is useless to carry on through the pages of the *American Machinist* some of the tribulations some foremen complain of simply because those foremen are not trained. In all my experience, I found the best foremen came from the ranks of the regular employees.

I know about a man, and knew the man personally since he was a kid, Joe F. Morrison, who had been employed in the old Edison Lamp Works. Starting as a boy, he got promoted from one better job to another until finally he reached the post of a vice-president in General Electric and is now retired.

He came from the ranks of employees; every other employee had the same chance. I worked in a job shop where the foreman had been an apprentice where I had been previously employed. He started in the job shop after he served his time and worked himself into the foreman's job.

This hiring a foreman from the outside is just a lot of foolishness. A boy employed in the A & P chain stores works himself up to become a manager of a store. Does that concern hire a manager from some other concern? Not on your life! They take him from their own ranks.

There are exceptions when the superintendent of a plant desires a foreman who he actually knows will fit and hires him in preference to taking a man out of the ranks, but selects one of the latter as an assistant foreman because he happens to know most everything relative to the industry.

House Cleaning

The tribulations of some foremen are a lot of boloney they have started to chew on and don't know enough to let go. All a lot of new foremen from the outside can think of when they take charge, is to clean up the shop. Out goes all the bric-a-brac Jim has been saving in his many years of struggle. Out goes a barrel full of junk George has cached underneath his bench. Ding-a-ling a lot of samples from dies that were made in the past fifteen or twenty years go into the ash can. They were indispensable to the toolmakers who had them hanging on the wall in front of their benches but of no use to the "dude" foreman. If that's all such foremen can think of when they take charge, then they should have hired out as foreman of an old graveyard where some of the tombstones are as old as Nebuchadnezzar himself.

TAKE CARE of your SAW TEETH

7 points are given by the authors to make the circular saw an effective tool for cutting off and slotting many materials

IRA W. HUEY and R. N. CAMBRIDGE
Westinghouse Electric & Manufacturing Company

LARGE SAVINGS may be effected by maintaining adequate saw repair groups and performing operations with circular saws and band saws which formerly were done with milling machines. At the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company small sizes of extruded metal and small sizes of bar stock are now cut almost entirely with circular saws, especially when the cut is to be held to machine tolerances. Also, circular saws are used for slotting work.

Alloys of copper and aluminum can be easily handled with circular saws. The design of the saw tooth for copper differs from that used for brass. When cutting copper the saw has alternate lead and wall teeth while those for cutting brass have alternate chamfered sides, as shown in Fig. 1.

The increasing use during the past few years of synthetic compounds such as micarta, bakelite and fiber board presented problems of cutting which were finally solved by the design of a high-speed saw. Now that the high-speed saw is in use for this kind of work, the question of saw repair and upkeep should be investigated.

There are seven requirements for good saw operation and efficiency.

1 Rim Clearance—If sufficient clearance is not given, the cut material cannot be removed fast enough to prevent the saw from becoming overheated due to friction. The sides of the teeth will wear off quickly, and a ragged cut edge results. Unnecessary waste of material may occur if the proper rim clearance is not made. For example, when micarta sheets 1 in. thick and 6 ft. long are split, there is sufficient waste, if the cut is made $\frac{1}{8}$ in. too wide, to amount to about $\frac{1}{4}$ lb. of material. Preventing this loss results in a worthwhile saving.

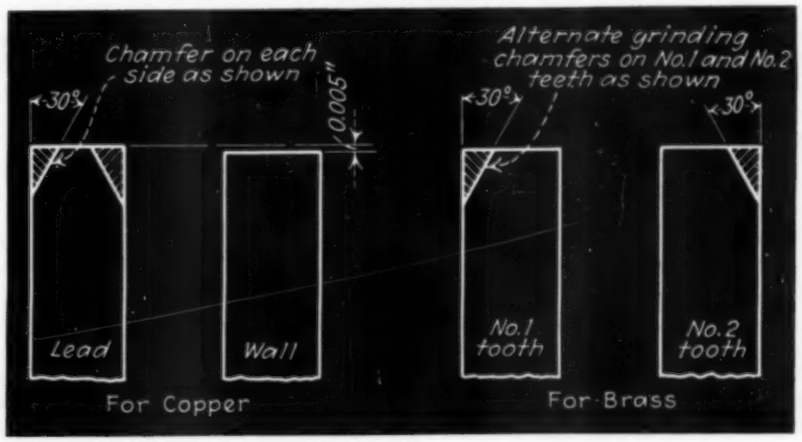
2 Balance—It is necessary that all saws be accurately balanced. Because they are operated at high speed (3,000 r.p.m.), it would be dangerous if they were not accurately balanced. The combination of centrifugal force and the unbalanced condition might make the saws wabble, thus affecting the clearance.

3 Level—Under normal operation, saws should be level to 0.002-0.003 in. A saw that isn't level will wave while in operation and heat due to friction. As a result the cutting edge will be worn down and the clearance will be lowered due to the rubbing action of the saw. No matter how sharp a saw may be it will not cut effectively unless level. Unlevel conditions will be indicated by the sides of the teeth being worn off and if the saw is kept in operation, it may show signs of being burned. The edge of the cut material will not be smooth.

4 Clearance in Gullet of Tooth—There must be sufficient clearance in the gullet to prevent the cut material from clogging. There is a certain amount of cooling action of the teeth when sufficient gullet clearance is made in the design. If the teeth get clogged, heating will occur and continued operation of the saw will result in crystallization and crack formation.

5 Relation of Speed with Amount of Clearance—There is a relation between the speed of the saw and the rim clearance. In order to be sure that the cut material can clear, care must be given that the saw is operated at the proper speed.

Fig. 1—Grinding must suit the material to be cut; even copper and brass require different tooth treatment



6 Relation of Feed to Rim Speed—This relation will affect the efficiency of the saw. Sufficient time must be allowed to clear the saw teeth and remove the cut material. The temperature at which the saw will operate will also depend on this relation.

7 Accurate Tension—In order to balance the centrifugal forces set up in the saw when it is up to speed and in operation, there should be a certain amount of tension in the saw. Tensioning is accomplished by hammering the saw and placing a strain in the material which will offset the centrifugal forces.

A study was made of the use of circular saws for splitting micarta sheets. Six circular saws mounted on the same arbor was used for this operation. The diameter of the saws must be the same in order to maintain the highest efficiency and saw life. It was found that some saws developed cracks on the periphery and saw replacements would then be necessary. What was causing these cracks? What could be done to prevent them? These saws are operated at 3,000 r.p.m. and it would be dangerous to attempt to operate a cracked saw.

After a series of tests and studies, it was determined that the cracks in the saws were caused principally by improper filing during repairs and sharpening. A dull file is worn more in the mid-section than on the ends. When filing the saw tooth the file is held so that the sharp end of the file starts the cut and makes a sharp groove in the throat of the tooth. As the file is pushed through the throat of the tooth, the worn part of the file cuts away the sides but does not round out the filed groove. This gives a groove similar to that shown in Fig. 2.

During the time these saws are in operation the heat that is created raises the temperature of the saw to a high degree. This high temperature, maintained for from four to six hours daily, causes crystallization in the saw tooth. The fine grooves caused by using a dull file will be the point at which a crack will start as the throat of the saw crystallizes due to grain growth in the structure of the steel. The smooth rounded cut of a sharp file will prevent these cracks.

The savings that can be made by supervising the filing of saws can easily be seen in the following example. In one instance two saws in the group of six were found to have cracks that prevented their further use. Two new saws had to be purchased. These new saws had to be circle-ground to the same diameter as the remaining four saws in the group. Teeth were then ground in the saws. The cost of circle-grinding is high and great care must be taken not to burn the metal during this operation. The saws must then be hollow-ground, leveled, and tensioned, operations which must be made with great care since the life of the saw is determined by them. It is quite evident that the cost necessitated by the two cracked saws is great. There are still two set-ups to be added, since the arbor was removed and must be set-up again.

The development of the saw tooth used for cutting micarta required some time. The cuttings are sticky and adhere to saw teeth. The problem of rim clearance was solved by hollow-grinding the saw. A larger number of teeth than previously considered practical was made, and the sides of the alternate teeth were chamfered in order to make lead teeth and wall teeth. The lead tooth was made 0.001 in. higher than the wall tooth. This design of saw tooth made it possible to cut micarta quickly and leave a smooth cut which was comparable to a milled edge. Machine tolerances could be held with this type saw. The throat of the tooth was ground out as shown in Fig. 3.

During saw repairs, if the teeth are ground, care should be taken that the tips of the saw teeth are not burned. When the saw teeth are burned the material has in a sense been annealed. The result will be that in operation the saw teeth will flatten out because the tips are soft. This spoils the set of the saw and the cut will not be smooth. If a tooth has been burned, the best procedure is to ground out the burned section by circle grinding the saw.

In conclusion, it might be said that effective cutting results from being able to remove cut material from the teeth as quickly as possible, so as to relieve choking at the rim, and removing the resistance between the cutting edge and the material being cut.

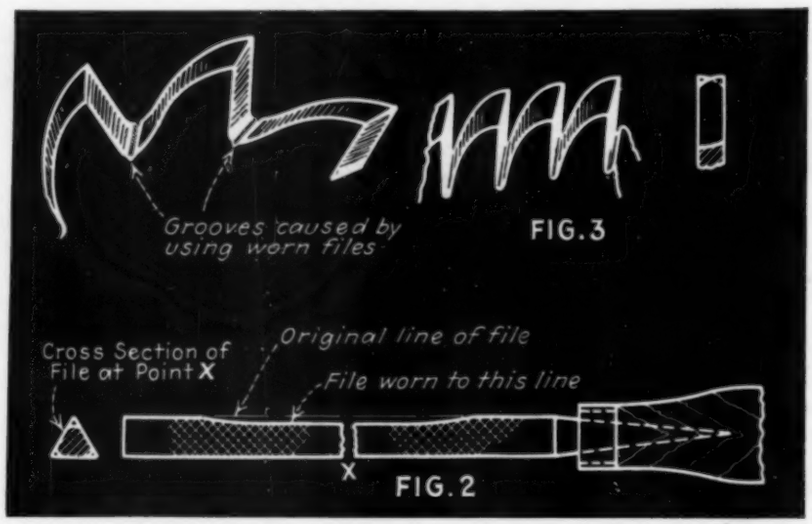


Fig. 2—Cracks caused by the use of worn files will materially shorten saw life. Fig. 3—For sawing micarta the lead tooth is made slightly higher with the throat ground as illustrated

Cast Crankshafts for Locomotives

C. G. WILLIAMS

The cast crankshaft is no new thing even in railroad shops, for away back in 1900, the original inside crank axles used on the Baldwin balanced compound locomotive were cast in one piece, and were bought from Krupp in Germany. These locomotives went to the Plant System and to the Santa Fe.

The next balanced compound locomotives built at Baldwin had built up axles, from disks and short stub axles. In France, Germany and England, the cast crank axle is no new thing. In England, today, I understand that it is about 50-50 with the later types of built up cranked axles. The new three cylinder, or at least one of them, on the Canadian Railways has cast crank axles inside of the frame. I understand that the cast steel driving wheel center with mainpin integral, has been tried several times also.

EDITORIALS

VOLUME 79 AMERICAN MACHINIST ESTABLISHED 1877 NUMBER 24

McGRAW-HILL PUBLISHING COMPANY, INC.

K. H. CONDIT • F. H. COLVIN
EDITORS

MR. BERRY ASKS TWO QUESTIONS

1 DOES INDUSTRY want legislation "for preserving to the Nation such social and economic advantages as were gained through previous emergency enactments"?

The quotation is from a statement by President Roosevelt.

Just what were the social gains? The narrowing of the spread between wages of skilled and wages of unskilled workers? Ask the journeyman machinist or the toolmaker.

The unparalleled flood of strikes and industrial disputes that followed Section 7a? Ask the wives of the strikers. Strikes are like wars, nobody wins.

The forcing of thousands of workers into the ranks of the unions many of them under racketeering control? The American Federation of Labor and its constituent unions are reported to collect many millions in dues for which it is not necessary to account. Have union members benefited many millions worth?

And what about economic advantages?

Did it help many of us to have the forces of natural recovery slowed down by laws and edicts that were unenforceable, unintelligible and unconstitutional? Witness the rebound of stock prices and machinery orders following the Schechter decision. Let's be fair about it and admit that the end of the codes released a good many business men and industrialists, and let them get back to their own jobs where their energy was sorely needed.

Is a badly unbalanced budget an economic gain? And how do we rate a rapidly rising national debt?

Before industry answers this first question it should have before it a list of the social and economic gains brought by New Deal laws. Even then the answer will be *No*.

2 What further steps need to be taken as "the best means of accelerating industrial recovery and eliminating unemployment"?

Probably the first steps should be the repeal of several unworkable laws that were put on the books by the last two Congresses. Each of us has ideas about which should come off first.

It should be painfully clear to anyone by this time that legislation cannot take the place of initiative, intelligence and hard work. Two outstanding examples are furnished by the automobile industry and the machine tool industry. All they asked was a chance to use their ingenuity in making good goods, and their old fashioned git-up-an'-git in selling them. Look what they've done.

The best "further steps" will be backward where legislation is concerned.

Should you go to the Berry meeting? Yes, if you received an invitation. Yes, if you did not receive one but want to be sure that the point of view of industry is vigorously presented. This is too serious a matter to let go by default. Remember how close the Walsh Bill came to passage in the last hours of the last Congress.

Adaptability

INDUSTRIAL engineers and other observers frequently criticize manufacturing plants for their failure to make use of tools and methods well known in other lines of industry. In too many cases shop executives seem to lack the ability to adapt ideas and methods unless the necessary changes are slight.

Adaptability, or the vision to see how tools or methods can be changed to fit conditions in another plant, is one of the greatest assets a shop executive can have. This ability will frequently save hours and dollars, not only in the cost of production, but in devising methods and mechanisms that may be had for the asking.

An excellent example of adaptation is to be found in the plant of Servel, Inc., one of which we are privileged to illustrate in this issue. Other phases of adaptability are perhaps equally valuable. It is an accomplishment that should be cultivated.

More Lincolns Needed

IN AN ADDRESS to a university group last week General Harbord of RCA remarked that it took the pony express seven and a half days to carry Lincoln's inaugural address from St. Jo to Sacramento. Today the West Coast citizens can listen to the delivery of such an important speech. Tomorrow they will be able to see the speaker as well as hear him. Such are the wonders of this machine age.

What we need today, according to the General, are more Lincolns to make use of these new and marvelous facilities. How true.

Chips

Washington — Election results indicate return to two party system . . . Party leaders of both sides claim victory, President discreetly silent . . . Berry and New Deal backers set stage for industry-labor-consumer gathering in Washington, December 9, by trying to create impression that crisis still exists . . . Federal Judge in Baltimore court declares Holding Company Law unconstitutional on all grounds . . . House committee making secret study of economy measures in government departments . . . 359 out of 377 newspapers believe that next federal budget should be balanced . . . Secretary Wallace says restriction of pig iron production is much worse than killing pigs . . . Secretary Roper says "breathing spell" is permanent (Here's hoping) . . . Roosevelt orders half-billion budget cut.

Foreign — Italian advance in Ethiopia continues unopposed as Mussolini issues edicts conserving resources affected by League sanctions . . . Hitler dissolves Stahlhelm, has Nazi "martyrs" placed in Munich temples . . . Japanese marines land at Shanghai as sailor is killed in brawl . . . Italy threatens reprisals on nations that enforce sanctions . . . Germany embargoes many raw materials needed for her own manufactures . . . Egyptian riots against British control result in many injuries.

Finance — China nationalizes silver to meet problems raised by U. S. silver buying policy . . . Holding companies wondering whether to register before December 1, as required, in view of decision declaring law unconstitutional . . . Influx of gold continues . . . Speaker at Bankers' Convention calls for credit boycott to halt government spending . . . Roosevelt chides bankers for 6 per cent and higher rates on real estate loans, bankers say they are not getting even 6 per cent . . . Sharp fight at Bankers' Convention precedes election of Orval Adams, New Deal critic, to second vice-presidency.

Industry — Kellogg Company makes 4-shift, 36-hour week permanent, raises pay of male workers . . . Labor Relations Board forces Fruehauf Trailer vice-president to name detective agency from which he hired undercover man . . . Industrial output highest in five years . . . Lewis heads new drive of industrial vertical unions against craft union group . . . Fertilizer industry asks approval of voluntary code . . . PWA reverses itself and holds up purchase of dumped German steel on two projects . . . Protests made by Commerce and Labor Departments, from steel makers and labor ranks . . . Kloeckner, head of German steel firm which got the orders, reports taking foreign orders at a considerable loss.

Trade — MacKenzie King, Canada's new Liberal premier, visits Washington to conclude trade treaty with Hull and Roosevelt . . . First November automobile show meets with unexpected success as large sales are reported . . . Luxury buying in New York astounds merchants . . . Members of Atlantic freight conference resign to meet rate war threat of outsiders, drastic rate cuts expected . . . Roper announces Census of Business to be taken simultaneously with Census of Manufactures for 1935.

Indicators — Steel production moves upward strongly . . . Electrical energy output up over 14 per cent above 1934 week . . . *Business Week's* index hits 68.8, crosses 1931 curve.

Administration Strives to Appease on Budget Unbalance and "Reforms"

WASHINGTON—Many things can happen between November 1935 and November 1936. If this had been a presidential year there is little doubt that Roosevelt would have been reelected. The cold figures indicate that he would have carried New York, would have lost all New England and New Jersey and Ohio, would have carried the solid South and border states.

The tremendous majority in Kentucky, despite a factional fight and a strong Republican candidate, is accepted as evidence that all of the border states such as Maryland, West Virginia, Missouri and Oklahoma would have gone Democratic. Few election figures came from the farm belt. The assumption is that Roosevelt would have carried most of the farm states west of the Mississippi, except possibly Kansas, and all the Rocky Mountain states.

Washington and Oregon may be alienated by the lumber provisions expected in the Canadian reciprocity treaty. Dairy provisions of the same agreement may place Wisconsin beyond the power of the LaFollettes to save the state for Roosevelt. Canadian cream and butter would certainly arouse resentment in Minnesota where 30 cents of the farmer's dollar comes from dairy sales.

New York state is overwhelmingly important. Its 47 electoral votes might not have been essential to Roosevelt if he had run November 5, but they are vital to any hope Republicans may have to defeat him. Roosevelt carried the state in 1932 by nearly 593,000; Lehman in 1934 by about 800,000. This year the Democratic lead was about 350,000. With continuation of New Deal slippage a possibility, New York may be regarded as a doubtful state for next year.

Fully realizing that the country is becoming tax conscious, the President last week issued informal orders to cut expenditures under the 1937 budget by $500,000,000. Another $500,000,000 is expected in increased tax revenues for the same period, which will enable the administration to pare the deficit by a billion dollars. Thus the budget will be in a position to balance during the fiscal year 1938.

The political objective is to make taxpayers feel more cheerful about heavy payments by reading that Washington is trimming expenses. Apparently the biggest "saving" will be made on relief. The government already has ample funds appropriated to take care of the situation. So much will be left over that next year's new appropriations — not expenditures — will look small in comparison.

Congress convenes in January. Do your senators and representatives know your point of view on business legislation? If not, better write or see them.

Meanwhile new security legislation taxes will start in January, first collections will be made in February. These will show up in advancing prices, not by direct levies on consumers.

As more lawyers study the Social Security Act legal opinion leans strongly to the view that unemployment insurance and old age pensions will be found unconstitutional. One member of the Social Security Board and some outstanding champions of the law concur in this view. Apparently there is no way of securing court decision before January 1937 because actual payments of benefits do not start until then.

Secretary Roper continued in this rôle as chief reassurer to business by interpreting the "breathing spell" promise to the Associated Grocery Manufacturers on November 13. The Secretary stated, presumably with Presidential sanction, that "it means specifically that the basic program of reform has been completed."

Having received acceptances from some 73 per cent of industrial leaders replying to his invitation, and practically unanimous support of labor leaders, George L. Berry, coordinator of industrial cooperation, set December 9 as the date of the meeting in Washington to determine the best means of accelerating industrial recovery, eliminating unemployment and maintaining business and labor standards. Attendance is expected to total

Frederick-Blessing Studio

Laboratory Goes Modern—**Approximately 13,000 sq.ft. of porcelain enameled surfaces are used in the recently completed laboratories of the Chicago Vitreous Enamel Co. Extensive use of color in striking hues, new surface finishes, indirect lighting and modernistic treatment combine to show what can be done with porcelain enameled sheets as a building material. Here is the main laboratory room 50x100 ft., and housing three miniature enameling plants for the study of various problems**

between two and three thousand, divided into 60 pairs of industrial groups, representing management and labor. Mr. Berry hopes that from the proposals presented a definite plan can be crystallized for submission to the President. While emphasizing the fact that the meeting has not been called to discuss legislation, he admitted that there is no doubt it would be brought up pro and con.

PWA picked up a hot potato when German steel was ordered for New York's Triborough Bridge. Protests piled up from Mayor La Guardia, from A.F.L. President Green, and from industrial and civic organizations. So loud were the outcries that it looked as though the isue might be put up to the President himself. This politically unwanted contingency was avoided when Secretary Ickes backed down on his former stand and ruled that he would personally pass on all purchases of foreign materials for PWA projects.

Canada Reduces Duties on American Machinery

American machinery and manufactured goods receive more benefits from reduction of duties than do agricultural commodities in the reciprocal trade treaty concluded November 15 between the United States and Canada. Industrial machinery, which formerly took a 35 per cent ad valorem rate, will enter Canada after January 1 at new rates ranging from 5 to 25 per cent. On most classes of farm equipment the new Canadian duty will be 12½ per cent instead of 25 per cent, and all classes of tractors will enter free. The agreement will run for three years. Canadian concessions outnumber American duty revisions.

Specific reductions in duties on manufactured and other non-agricultural products apply to a trade that reached $145,000,000 in the fiscal year 1929-1930. Moreover, Canada guarantees the lowest rates of duties now paid on products originating in non-British countries to a trade that was worth $220,000,000 in the same period.

There is no way of telling what effect these reductions will have on the status of American branch plants in Canada. The investment in them is now about $500,000,000. There has been a feeling among officials in Washington that such plants should be repatriated, but the concessions on some classes of manufactured goods would have to be materially increased to bring back branch plant operations to this country.

President Flanders is Towne Lecturer for the A.S.M.E. Annual Meeting

As evidence of the growing interest by technical societies in subjects not strictly of an engineering nature, the 56th annual meeting of the American Society of Mechanical Engineers will have several sessions devoted to such subjects as human relations and industrial management, the effect of technological change on human relations, compensation laws, occupational diseases, and work assignments. The condensed program lists the papers on these topics, as well as many of those from the much larger group on strictly technical topics.

As usual, the annual meeting will be held at the Engineering Societies Building, New York, N. Y., and will extend from December 2-6. Monday, December 2, will be given over to a meeting of the council and the annual business meeting so that Tuesday, Wednesday and Thursday will be free for technical sessions. These will take place during the mornings and afternoons, so as not to interfere with social events during the evenings. Greater emphasis is being placed on the latter this year to enhance their dignity and to increase interest among the members.

Tuesday evening will be known as Honors Night. The A.S.M.E., Warner, Melville and John Fritz medals will be awarded. The last goes to Professor Durand, past-president of the A.S.M.E., as already announced (*AM*—Vol. 79, page 828g). Also scheduled for Tuesday evening is the Thurston lecture to be delivered by C. H. Purcell, chief engineer of the San Francisco-Oakland Bay Bridge.

President Ralph E. Flanders' address will be a feature of the annual dinner on Wednesday evening. Because Mr. Flanders is also the 1935 Towne lecturer, the two addresses have been combined and the subject is to be "New Pioneers on a New Frontier." Another national figure will also address the dinner meeting.

Program of the A.S.M.E. Annual Meeting

TUESDAY, DECEMBER 3

9:30 a.m.

Machine Shop Session

Desired Characteristics of Surface Finishes by J. E. KLINE.

Steel Plate Structures vs. Cast Iron by R. T. HAZELTON.

9:30 a.m.

Psychology Session

Symposium on Effect on Human Relations of Technological Changes.

The place of Skill in Industry by DR. LILLIAN M. GILBRETH.

Human Problems as Created by the Introduction of Labor Saving Machinery by PROF. ELIZABETH F. BAKER.

What is the Effect on Employees of Technological Changes by PROF. M. S. VITALES.

The Development of Physiological Efficiency and the Maintenance of Health When Introducing a Technological Change by DR. H. W. HAGGARD.

Methods of Introducing Technological Changes by C. S. CHING.

9:30 a.m.

Mechanical Springs Session

Maximum Shearing Stresses in Eccentrically Loaded Helical Springs of Circular Wire by PROF. H. C. PERKINS.

Correlation of Spring Wire Bending and Torsion Fatigue Tests by E. E. WEIBEL.

2 p.m.

Railroad Session

Locomotive and Car Journal Lubrication by E. S. PEARCE.

2 p.m.

Psychology Session

Continued with discussion of morning papers.

2 p.m.

Creep of Metals Session

(Applied Mechanics and Iron & Steel Divisions).

Design Aspect of Creep by R. W. BAILEY.

A Method of Analyzing Creep Data by R. G. STURM, C. DUMONT and F. M. HOWELL.

The Creep of Metals by A. NADAI and E. A. DAVIS.

Residual Stresses in Cold Drawn Brass Tubes by C. G. ANDERSON.

WEDNESDAY, DECEMBER 4

9:30 a.m.

Occupational Disease Session

(Auspices A.S.M.E. Safety Committee)

The Additional Responsibility Placed upon Industry by Recent Occupational Disease Legislation by H. D. SAYER.

Engineering Control or Occupational Disease Hazards by WARREN COOK.

The Limitations of Protective Devices and Equipment by PROF. PHILIP DRINKER.

9:30 a.m.

Metal Cutting Session

A Study of the Turning of Steel Employing a New Type Three Component Dynamometer by PROF. O. W. BOSTON and C. E. KRAUS.

The Torque and Thrust of Small Drills Operating in Various Metals by PROF. O. W. BOSTON and W. W. GILBERT.

9:30 a.m.

Iron and Steel Session

Bearing Investigation by the Varying Wear Method by J. R. CONNELLY and C. C. HERTEL.

Discussion of Pressure Indicating and Control Equipment for Rolling Mills led by F. BUCKINGHAM, O. S. PETERS and S. B. TERRY.

Control of Bearing Pressures in Rolling Mills by O. S. PETERS and F. BUCKINGHAM.

2 p.m.

Power Session

Stresses in Three Dimensional Pipe Bends by WM. HOVGAARD.

Creep Strength of Steels as Influenced by Microstructure by L. L. WYMAN.

2 p.m.

Compensation Laws Sessions

Present Status of Workers Compensation Laws by F. ROBERTSON JONES, FREDERICK S. KELLOGG and AUSTIN J. LILLY.

THURSDAY, DECEMBER 5

9:30 a.m.

Costs Session

Fundamentals of Cost Accounting by CHAS. REITELL.

Industrial Production Costs by E. S. LAROSE.

9:30 a.m.

Applied Mechanics Session

Fatigue of Cold Rolled Specimens by O. J. HORGER and J. L. MAULBETSCH.

Rate of Development of Fatigue Cracks in Steel by A. E. DEFOREST.

Mechanical Properties of Bakelite and its Behavior at Failure by M. M. FROCHT.

Marblette as a New Photo-Elastic Material by A. G. SOLAKIAN.

2 p.m.

Costs Session

Industrial Production Costs by C. H. KNAPP.

Power Distribution Costs by MORRIS L. COOKE.

John W. O'Leary Decries Wages-Hours Regulation

Regulation of hours and wages in the machinery and allied industries is not feasible, according to John W. O'Leary, president of the Machinery & Allied Products Institute. His contention is that the fluctuation of orders makes such regulation impossible. A study which he reported showed that the month to month variation in durable goods production is three times the variation in production of consumers goods. His reason for such variation is that only a small percentage of the products of the machinery industry can be built for inventory.

Leipzig Spring Fair Scheduled for March

Over 8,000 exhibits gathered from twenty countries will feature the Spring Fair at Leipzig, Germany. The engineering section will be open from March 1 to 9 inclusive. It is expected that 180,000 business men from 72 countries will attend. American offices for the Fair are at Leipzig Trade Fair, Inc., 10 East 40th St., New York, N. Y.

Car Manufacturers Fatten On Orders; Tool Shops Face Long, Cold Winter

DETROIT—While it is too early to state whether the November introduction date is a complete success, the fact cannot be denied that production in the months of October, November and December will be greater than has been experienced heretofore. Climbing from 44,000 per week the middle of October, output reached over 70,000 per week by the last of the month. Succeeding monthly schedules are anticipated to run in the neighborhood of 350,000. Despite the rapid building up of new models for the purpose of stocking dealers in time for the New York show opening, the customer who wishes to buy a car at the present time may expect to wait from a week to ten days before delivery. The Cadillac Motor Company estimated that about 80 cars per day would supply the needs for the new line of cars, but at present facilities are being pushed to produce 160 per day, so persistent is the demand. It is reported that the new series 60 is responsible for this increase. When the Hudson line was revealed early last month, the dealers estimated that 18,000 could be sold during the remainder of 1935. Within the succeeding six weeks, it is understood that 29,000 were sold and expectations now point to 50,000 by the end of the year. Pontiac expects to increase output the last four months of '35 from an estimated 48,000 to 57,000. Chevrolet has a schedule of 100,000 per month for the next few months.

The introduction of cars two months earlier than customary has not affected the pressure put upon assembly plants and suppliers to reach peak production. In September, according to figures of the A.M.A., 59,329 cars were produced and in October 210,392. All companies are included in these figures except the Ford Motor Company, which is not a member. One basic supplier states that 32,000 units were produced in his factory in September and

Industrial Review

• Reports from machinery distributors in the leading industrial centers indicate that the satisfactory level of business in October is being maintained through November. Some part of this activity is based on the fact that automobile builders and their parts suppliers are extremely busy for this time of year, due of course to the early automobile shows. It is also true, however, that orders are coming from all sectors of the machinery market which augurs well for the future. The reduced Canadian import duties on machinery should prove very beneficial to the American industry after the first of the year.

• New England distributors say that orders are holding up reasonably well and they have many active inquiries which they expect to close before the end of the year. Shortage of skilled labor is still a problem. New York reports little change for the Metropolitan area, many orders being taken. Philadelphia has not been so busy. There seem to be plenty of inquiries but they are slow in closing. In Pittsburgh incoming orders are distinguished by the wide variety of small individual orders. Inquiries are only fair at present, but are expected to improve later. A skilled labor shortage exists here also.

• Employment particularly of skilled workers has advanced substantially in the last four weeks in Cleveland. Machine tool orders in November are likely to exceed the October level. Business is looking up in Detroit although there is still a noticeable delay in the placing of machine tool orders. Inquiries are increasing, however, and the market for small tools and supplies is very strong. In Toledo sales are holding up fairly well, but are not up to the level reached in July and August. Plants are speeding up production. The labor situation is fair.

• Reports from Cincinnati are that the local situation still looks encouraging. Business is being placed although inquiries have commenced to taper off. The labor situation is good. Much the same condition prevails in St. Louis. Inquiries are fair and orders likewise.

• Chicago continues to be highly optimistic on sales prospects for the rest of the winter. Labor conditions in the region surrounding Chicago are quite mixed. In Milwaukee labor is quiet with the exception of one bad strike at a stove plant. Business is off somewhat from the October level. Word from the Pacific Coast is that orders have declined somewhat from the high October level.

58,000 in October. Excess scrap, cost and training problems are inherent in such a situation as well as an uneconomical use of man power. This means that in September and well into October, supplier plants were turning out production and at the same time adding and rearranging facilities for greater production. Such rush conditions can hardly be remedied as long as all introductions come at the same time, whether the date be November 1 or January 1.

The claimed shortage of skilled workers is very real at present, but should be evaluated against the peaks in the employment curve. 1935 was a year of unusually steady employment for productive labor in the industry, what with early model introductions. Tool and die makers, however, are now largely out of work, except the basic crews maintained in corporation shops. Pulling some of the spring peak over into the winter months, while a boon to productive workers, will scarcely benefit the tool and die makers. Even when the automotive plants are shut down for the change over to new models, from 30 to 40 per cent of the productive workers are retained to prepare the plant for its new job.

Behind the Scenes

While sales departments now hold the spot light, engineers are quietly working behind the scenes on motors for the 1937 version of the automobile. Ordinarily work of this kind is not in evidence until March, but much of it is now filtering into shops equipped to undertake this kind of work.

As one tool and die manufacturer expressed it, "The Industry is now working on odds and ends the Industry forgot." Some changes are of course always being made. However, the tooling for a Russian Ford accounts for the larger slice of business at present. It is understood that a similar program for a Russian Buick was placed in Philadelphia. Foundries and pattern shops are now resting on their oars; work on breakage and repairs is expected to offer the only work till the '37 program begins. Some duplication of dies and tools is experienced when night shifts are abolished.

Demand for used machinery is stated to be brisk and general, October being on a par with the three previous months. Despite a used list issued by Chrysler and the Chevrolet plants in Detroit, the supply is under the demand. Automobile plants, except in a pinch, do not buy much used machinery.

Labor difficulties are non-existent at present, thought it would be rash to predict that they will continue so. Before works councils were introduced into the industry changes in time standards were introduced without notice. At present, such changes as result from engineering design are explained as to their necessity by the supervisor before being introduced.

General Motors will, about December 1, begin the construction of an assembly plant in Los Angeles for the production of Pontiac, Olds, and Buick cars, representing the first assembly plant built for these cars away from their home plants. This will supply the demands of the Pacific coast for these cars.

Sustained Domestic Demand Puts German Concerns on Dividend Basis

BERLIN—The high rate of operation in the German machinery industry reached during the preceding months was in general maintained in August and September. The domestic market and, in particular, orders connected directly or indirectly with rearmament and public works continued to be the basis of this recovery. Foreign business was barely maintained at the low levels to which it has fallen in the last few years, although certain branches have recently been showing encouraging signs of incipient recovery.

Increases in orders were reported in September in metal - working machinery, mining machinery and certain sections of machines for foodstuffs industries. On the other hand, business was less satisfactory in rolling stock, wood-working machines and most branches of textile machinery (with the exception of machines for the rayon industry). The automobile industry showed the first signs of seasonal decline in August when the production of passenger cars fell to 16,500 against 20,600 in July, and that of trucks from 3,530 to 3,490.

The German Institute for Business Research (Institut fuer Konjunkturforschung) has published a timely and instructive statistical analysis of the export trade of the three main machinery exporting countries of the world—Germany, Great Britain and the United States. The main results of this survey are shown in the following table.

As may be gathered from these figures, Germany which, at the end of 1932, exported 45 per cent of all machinery exported by these three countries, reduced its share to 27.8 per cent in the first half of 1935 and fell back from the first to the third place. In contrast herewith, Great Britain increased her share from 31.6 to 36.6 per cent and moved to the first place. The United States made a good second with 35 per cent of total exports which represents a striking gain against a share of 23.4 per cent in 1932.

The Institute attributes this development in the first place to the advantage which both Great Britain and the United States enjoyed owing to the depreciation of their currencies. In fact, in a special analysis the Institute attempts to establish a complete parallelism between the depreciation rate of the pound sterling and the dollar on the one hand, and the increased share of Great Britain and the United States in total machinery exports on the other hand.

There seems, however, to have been another noteworthy reason for the heavy losses of the German machinery export trade. In past years a considerable part of Germany's total machinery exports went to gold bloc countries, namely 43 per cent in 1929 and 50 per cent in 1932 (Russia excluded). On the other hand, Great Britain and the United States sold a much smaller part of their machine exports to these countries (Great Britain 17 and 15 per cent and the U. S. 7 and 16 per cent).

The gold bloc countries suffered most from the pressure of deflation which, in

Share of Three Countries in the Total of Their Machine Exports* (in per cent)

	Germany	Great Britain	U.S.A.	Total
1932, 2nd half year.....	45.0	31.6	23.4	100.0
1933, 1st " "	42.0	34.5	23.5	100.0
2nd " "	39.2	33.2	27.6	100.0
1934, 1st " "	32.5	33.4	34.1	100.0
2nd " "	30.0	35.5	34.5	100.0
1935, 1st " "	27.8	36.6	35.6	100.0

*Export "volume," i.e., machine exports evaluated in 1929 prices.

turn, paralyzed investment activity and reduced their demand for foreign machinery. This adversely affected German exports of machinery to these countries. In contrast, the British and American machinery industry benefited by the business recovery and increasing investments in countries with depreciated currencies, especially in the countries of the sterling bloc.

Resumption of dividend payments by most of Germany's leading machinery concerns is an encouraging sign of their consolidated financial position and of their restored earning power. It is a common feature of the latest balance sheets and reports that turnover has risen much more sharply than net profits and that, in turn, these latter show higher gains than the amounts distributed in dividends. This is to be attributed to the policy of the present government, which not only exercises considerable pressure on industry in order to induce it to reinvest as large a portion of its profits as possible, but also deliberately discourages, by various technical devices, the payment of high dividends, especially in regard to companies engaged in the production of munitions.

To quote one of the most typical and significant examples, the well-known M.A.N. (Maschinenfabrik Augsburg-Nuernberg A.G.) realized a net profit of 1,320,000 marks in the business year ending June 30, 1935 (against 150,000 marks last year), which enables it to write off all losses of previous years.

Machine Tool Orders Regain Stable Position

Domestic machine-tool business in October regained the general level established during June, July and August, the index now standing at 79.5. Prospective orders and live inquiries on hand indicate that November and the rest of the year should see as much business as October and possibly slightly more.

Improved domestic business is responsible for returning the industry to a total index above parity in terms of the 1926 level. The exact value is 102.9. Thus, October is the third month of the year to attain this distinction.

Foreign business was slightly less than the preceding month, but is still twice the amount done in the opening months of the year. Even so, October's foreign business was about one-half of that for the record month of the year, August, when the index jumped to 47.6.

When the domestic indexes for the large and small companies are averaged for the last five months, the average index for the large concerns is 72.9 and for the small companies it is 90.9. But such a large part is played in the over-all picture by foreign business, however, that the totals for the large and small companies are nearly equal, being 103.9 and 103.7. Thus, in point of orders taken at home the small group is relatively better off by about 25 per cent, but the relatively better success of the large firms in the foreign field has put the two groups on an equal footing so far as total business is concerned.

Table I—Index of Orders Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Foreign	Total	3 Months' Average Index	% Foreign to Total Orders
1935—April	54.5	11.2	65.6	60.3	17
May	57.3	16.0	73.3	67.1	21
June	75.5	15.6	91.1	76.7	17
July	82.5	37.3	119.8	94.7	31
August	78.2	47.6	125.8	112.2	37
September	54.1	25.9	80.0	108.5	32
October	79.5	23.4	102.9	102.9	23

Table II—Index of Orders—By Size of Companies

Month	Index of Orders: Domestic	Foreign	Total	No. of Reports	% Foreign to Total Orders
Group A—Companies reporting year's sales in 1926 of $200,000 or more:					
1935—April	54.8	11.8	66.6	94	18
May	57.3	16.7	74.0	83	23
June	76.0	16.0	92.0	88	17
July	80.3	38.8	119.1	87	33
August	77.2	49.3	126.5	85	39
September	53.0	27.0	80.0	87	34
October	78.2	23.9	....	86	23
Group B—Companies reporting year's sales in 1926 of less than $200,000:					
1935—April	48.0	3.8	51.8	75	7
May	57.3	3.2	60.5	55	5
June	68.1	10.9	79.0	69	14
July	117.6	13.8	131.4	62	10
August	95.4	19.1	114.5	58	17
September	72.0	7.8	79.8	63	10
October	101.6	13.4	115.0	61	12

Table III—Distribution of Orders

(Shown by indexes of individual companies)

New Orders in % of 1926 Shipments	Number of Reports in Each Index Group: March	April	May	June	July	August	September	October
200 or more	6	7	6	14	31	22	10	19
100–199	25	21	21	31	35	33	30	31
90–99	8	3	8	8	5	3	7	7
80–89	5	9	3	8	7	6	5	12
70–79	9	13	11	10	8	5	4	11
60–69	7	13	6	10	8	10	8	6
50–59	15	13	8	5	14	10	14	10
40–49	21	16	9	7	9	12	11	6
30–39	21	14	11	15	7	8	22	11
20–29	13	17	15	15	9	10	14	14
10–19	23	18	11	14	6	9	8	8
Less than 10	19	25	29	20	10	16	17	12
Total Reports	172	169	138	157	149	144	150	147

PERSONALS

THOMAS HOLLOWAY, gear consultant with the United Engineering & Foundry Co., has resigned.

WALTER KAHL, formerly in charge of the tool and die department, International Silver Co., Meriden, Conn., has been appointed manager of Factory T.

WILLIS C. GOODALE, assistant works manager of Underwood Elliott Fisher-Typewriter Co., Hartford, Conn., for many years, has resigned.

OBITUARIES

ALVA L. EVANS, associated with Warner & Swasey Co., died November 3. Mr. Evans was manager of the Philadelphia branch.

ARTHUR J. MASON, assistant superintendent of Bush Mfg. Co., Hartford, Conn., died recently. Mr. Mason had been assistant superintendent of the company for the past ten years.

WILLIAM HOPF, inventor, died November 4, in Rosenbergen, Germany. Mr. Hopf had been connected with Singer Sewing Machine Co. for many years, prior to his retirement five years ago. To him are attributed several important improvements on the sewing machine.

JAMES B. GREEN, 57, superintendent of Lucas Machine Tool Co., Cleveland, died Nov. 8. He had been with the company for 35 years.

MEETINGS

AMERICAN ENGINEERING COUNCIL. Annual meeting, Jan. 9-11, Washington, D. C. FREDERICK M. FEIKER, executive secretary, 744 Jackson Place, Washington, D. C.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting, Dec. 2-6. Engineering Societies Bldg., New York. CLARENCE E. DAVIES, secretary, 29 West 39th St., New York, N. Y.

CHEMICAL INDUSTRIES. Fifteenth exposition, Dec. 2-7. Grand Central Palace, New York. CHARLES F. ROTH, manager, Grand Central Palace Bldg., New York, N. Y.

NATIONAL ASSOCIATION OF MANUFACTURERS. Annual meeting, Dec. 4-5. Hotel Commodore, New York. NOEL SARGENT, secretary, 11 West 42d St., New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS. Annual meeting, Jan. 13-17, 1936. Book Cadillac Hotel, Detroit, Mich. JOHN A. C. WARNER, secretary, 29 West 39th St., New York, N. Y.

BUSINESS ITEMS

Michigan Tool Co. has awarded contracts for a new plant adjacent to its present factory on McNichols Rd., Detroit. This additional floor space, some 20,000 sq.ft., will enable the company to re-arrange production for greater efficiency.

Gibb-Lewis Co., 1331 Continental Illinois Bank Bldg., 231 S. LaSalle St., Chicago, Ill., has been formed by W. H. GIBB for the purpose of dealing in patents and patented articles. Mr. Gibb has resigned as vice-president of Thomson-Gibb Electric Welding Co., Lynn, Mass., and Bay City, Mich., but continues as a member of the board of the latter company.

Erie Foundry Co., Erie, Pa., has appointed the Syracuse Supply Co., to represent it in territories covered by its machine-tool division in the following offices: Syracuse—314 W. Fayette St.; Rochester—Lincoln Alliance Bank Bldg.; Buffalo—296 Delaware Ave.

Metal Spray Co., 113 Llewellyn St., Los Angeles, Cal., has been succeeded by the Metalspray Co., Inc., at the same address. Additions to the personnel include J. C. MARTIN, who was elected president and H. B. RICE, vice-president. Mr. Martin has been consulting engineer and patent counsel for several large concerns, and Mr. Rice has been in the metal spray industry for five years, previously having been district manager for Oxweld.

The Lakeside Welding Co., has been organized by JOHN G. LINCOLN and HOMER MEANOR. The new company's shop will be located at 3005 E. 55th St., Cleveland, Ohio. It will handle commercial welding work of all kinds, including machine parts and bases, as well as contract welding in the tank building, railroad and bridge fields. Mr. Lincoln is the son of the chairman of the board, Lincoln Electric Co., and did much research work.

PATENTS

October 29, 1935

Metal-Working Machinery

Metal Sawing and Filing Machine. Vitus A. Boker, Minneapolis, Minn. Patent 2,018,831.

Grinding Machine. Warren F. Fraser, Westboro, Mass. Patent 2,018,847.

Crank Shaft Forming Machine. Clarence S. Swanson, Chicago, and Dana R. Cornell and Carl Albin Aldrin, East Chicago, Ill., assigned to Standard Forgings Co. Patent 2,018,931.

Multiple Spindle Hydraulic Screw Machine. Harry W. Ruppel, Shaker Heights, Ohio, assigned to the Cleveland Automatic Co. Patent 2,019,155.

Saw Filing Machine. Edwin T. Altman, Belle Glade, Fla. Patent 2,019,330.

Tools and Attachments

Metal Cutting or Reaming Device. Marsden C. Hutto, Detroit, Mich., assigned to Hutto Engineering Co., Inc. Patent 2,018,674.

Electromagnetic Controller for Power Driven Machines. Howard E. Hodgson, Wauwatosa, Wis., assigned to Cutler-Hammer, Inc. Patent 2,018,720.

Piston Ring-Groove Scraper and Groove Deepener. Charles D. Stromgren, Los Angeles, Cal. Patent 2,018,930.

Welder Control. Carroll Stansbury, Wauwatosa, Wis., assigned to Cutler-Hammer, Inc. Patent 2,019,027.

Thermostatic Control for Grinding Machines. Harold E. Balsiger, Waynesboro, Pa., assigned to Landis Tool Co. Patent 2,019,040.

Hydraulic and Spring Operated Expansive Reamer. John Grant, Los Angeles, Cal. Patent 2,019,047.

Timing Device for Cam Grinding Machines. Conrad L. Ott, Waynesboro, Pa., assigned to Landis Tool Co. Patent 2,019,088.

Screw Threading Tool. Ignatius Bond, Evanston, Ill., assigned to Karl Reifenberg. Patent 2,019,391.

Processes

Process of Treating Aluminum Surfaces. Herbert E. Wetherbee, Cleveland Heights, Ohio, assigned to Benton H. Grant and Richard F. Grant. Patent 2,018,694.

Process of Making Composite Metal Plates. Wallace C. Johnson, South Orange, and Alfred E. Maskrey, North Long Branch, N. J., assigned to the Plykrome Corporation. Patent 2,018,725.

November 5, 1935

Metal-Working Machinery

Hydraulically Propelled Machine Tool. Hans Ernst and Lester F. Nenninger, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 2,019,486.

Scoring Machine. William M. Maher, San Francisco, Cal., assigned to American Can Co. Patent 2,019,499.

Hydraulic Column and Arm Clamp With Elevating Control. Lawrence Lee Schauer and Augustus Marius Sosa, Cincinnati, Ohio, assigned to the Cincinnati Bickford Tool Co. Patent 2,019,509.

Surface Grinder. George T. Huxford, Providence, R. I., assigned to Builders Iron Foundry, Providence, R. I. Patent 2,019,677.

Rotary Drilling Machine. William J. Mitchell, San Francisco, Cal., assigned to Pneumatic Tool Co. Patent 2,019,761.

Polishing Machine. Alfred V. Breed, Jamestown, N. Y., assigned to Curtis Machine Corp. Patent 2,019,889.

Arc-Welding Machine. Robert K. Hopkins, New York, N. Y., assigned to the M. W. Kellogg Co. Patents 2,019,970 and 2,019,971.

Hydraulic Press. James S. Rodgers, Minneapolis, Minn., assigned to John L. Rodgers, George A. Rodgers and James S. Rodgers. Patent 2,020,162.

Electric Heating and Welding. William E. Crawford, Wauwatosa, Wis., assigned to A. O. Smith Corp. Patent 2,020,276.

Tools and Attachments

Feed Regulator for Machine Tools. Hans Ernst and Lester F. Nenninger, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 2,019,487.

Strip Stock Feeding and Gaging. Magnus E. Widell, Cincinnati, Ohio, assigned to American Can Co. Patent 2,019,518.

Tool and Method of Making the Same. Karl Schroter, Berlin-Lichtenberg, and Hans Wolff, Berlin, Germany, assigned to Fried, Krupp Aktiengesellschaft. Patent 2,019,934.

Power Hammer. Charles B. Coates, Cleveland, Ohio, assigned to Chicago Pneumatic Tool Co. Patent 2,019,018.

Cutting, Grinding and Burnishing Tool and the Production Thereof. Albert E. Johnston, East Orange, N. J., assigned to Calibron Products, Inc. Patent 2,020,117.

Processes

Method of Producing Composite Sheets. Claude B. Bailey, Wyandotte, Mich., assigned to McCord Radiator & Mfg. Co. Patent 2,019,474.

Inhibitor and Method of Preventing the Chemical Attack of Metals. Frank D. Burke, Rocky River, Ohio. Patent 2,019,559.

Process for Producing Clad Metals. Frank H. Driggs, Bloomfield, N. J., assigned to Westinghouse Lamp Co. Patent 2,019,599.

Nine Months' Earnings—By Industries

(In Thousands)

Industry	*Number of Concerns*	*1934*	*1935*	*Per Cent Change*
Aircraft	3	$765	$772	+ 1.0
Automobiles	9	90,914	135,049	+ 48.5
Automotive Accessories	31	22,409	37,187	+ 65.9
Construction Materials	10	3,738	5,234	+ 40.0
Electrical Equipment	6	13,639	27,346	+100.5
Household Equipment	11	9,181	9,096	— 0.9
Machinery & Machinery Equipment	22	7,126	14,844	+108.3
Metal Products	7	5,412	5,720	+ 5.7
Office & Business Equipment	6	10,117	11,473	+ 13.4
Railway Equipment	6	*d*2,414	*d*1,351	def. decreased
Steel & Iron	25	*d*7,374	24,569	loss to profit

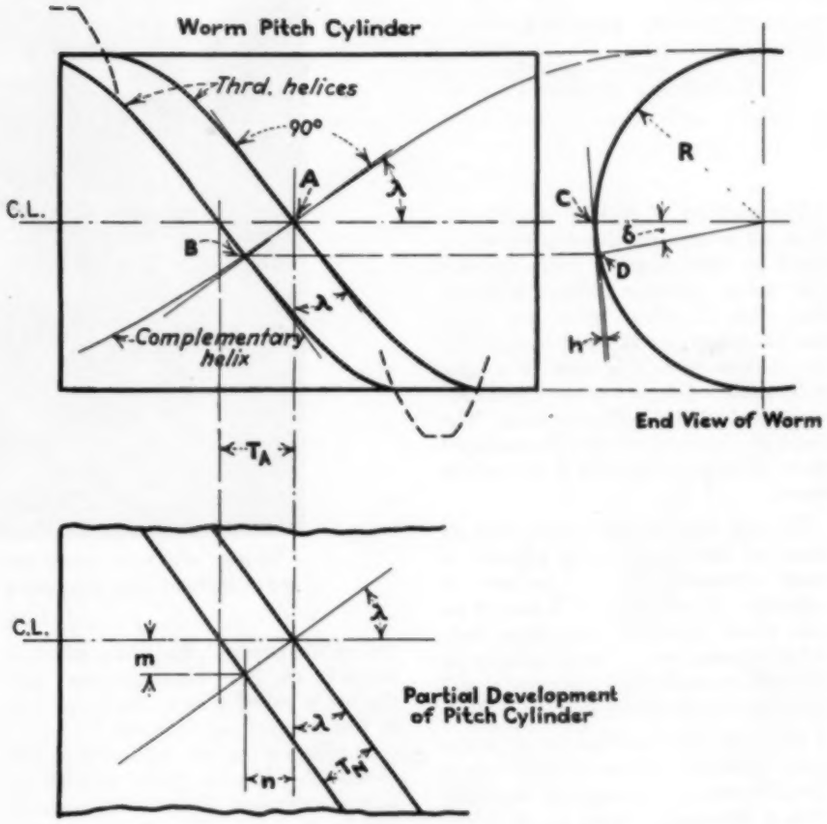
d—deficit

(From *Business Week*)

American Machinist — REFERENCE BOOK SHEET ©

Worm Thread Measurement

T. R. RIDEOUT
Nuttall Works, Westinghouse Electric & Mfg. Company



Gear-tooth vernier calipers measure straight line distances only, but the normal circular thickness of a worm thread lies on a helix normal or complementary to the helix of the thread at the pitch line. This is a warped line; that is, one whose projection on any plane will be curved. The axial thickness is, however, a straight line.

In order to measure the normal circular thickness of a worm thread, it is necessary to detemine the shortest straight-line distance between the ends of the warped line length of the normal circular thickness. This straight line will be the normal chordal thickness of the worm thread.

The formulas below are for obtaining caliper settings for measuring threads. These formulas have been checked several times for extreme cases by accurate laboratory measurements and have been found to be exact. In view of the ever-increasing use of high lead angles and the demand for greater accuracy, the formulas and their derivations are given for use in cases where conventional approximations are not sufficiently accurate.

FORMULAS for NORMAL CHORDAL TOOTH DIMENSIONS of WORM THREADS

See diagram:

T_A = Axial thickness of thread
T_N = Normal circular thickness of thread
R = Pitch radius of worm
λ = Lead angle of worm

$T_N = T_A \cos \lambda$

T_N = Distance AB on warped line of complementary helix

$m = \text{arc } CD = T_N \sin \lambda$

$\delta \text{ (radians)} = \dfrac{m}{R}$ ($\delta° = \delta$ radians $\times$ 57.29578)

$\text{Chord } CD = 2(R \sin \frac{1}{2} \delta°)$

$n = T_N \cos \lambda$

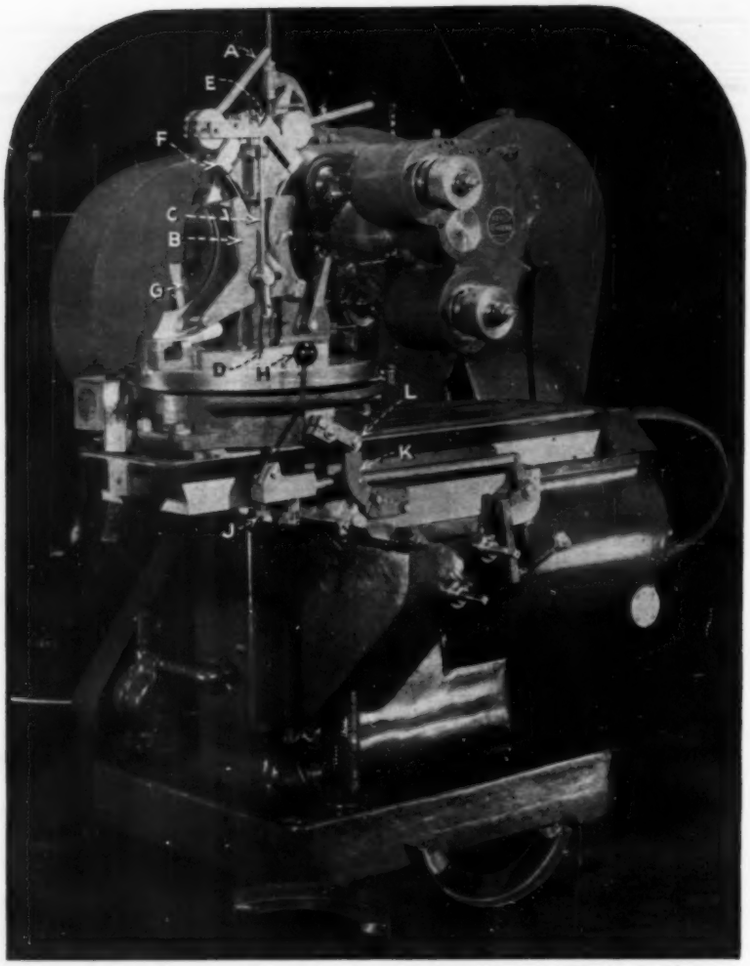
Normal chordal thickness = $\sqrt{\text{chord } CD^2 + n^2}$

$h = R(1 - \cos \frac{1}{2} \delta°)$

Corrected addendum = addendum + h

FOUR FACES on a BRAKE SHOE

A. HAPPEL
Chief Engineer
Kent-Owens Machine Company



Clamping with one motion and automatically locking the feed until correctly indexed, this two-station set-up combines high output with safety

The problem of milling several surfaces, all in true relationship on pieces which by their shape or frail construction make accurate set-up difficult, may often be solved by milling them simultaneously, or at least in one set-up. Generally this is done in a specially designed fixture or by special arrangement of the milling cutters. The problem becomes more complicated when the workpiece itself is difficult to locate.

On long runs or high production, as much of the operation as possible is made automatic for the purpose of economy. A case in point is that of an auto truck T-shaped brake shoe having a tapered web. Four surfaces on this web are milled; all are parallel and must be central to the web.

The job was handled in an automatic indexing fixture mounted on a Kent-Owens milling machine, equipped with a four-spindle head for shell end mills. When setting up, the lower back cutter is adjusted to the correct position by traversing the table in or out. The other three cutters are then adjusted by moving their quills. One turn of the large quill nut advances the cutter 0.100 in.

Rigidity is enhanced by automatically clamping the fixture top solid to its base during the cutting stroke. This clamp is released during the index period by cam *K* engaging roller *L*.

The fixture, mounted on a horizontal indexing table, has two stations and holds one brake shoe at each station. Each work piece in turn is fed between the cutters as the table moves forward.

To minimize loading time, all clamping is done by hand lever *A* at the top of the fixture. The shoe, which is located on its circumference and against a swivel post at its lower end, is first centralized between four buttons gripping the web by means of side clamp *B*. Moving lever *A* with its finger extension *E* releases a catch which otherwise holds the clamp open for loading. Releasing the catch permits spring *D* to force push rod *C* upward, actuating clamp *B*. Further motion of hand lever *A* allows top clamp *F* to advance over the end of the brake shoe and the cam to lock it securely in place.

When unloading, the operator, throwing hand lever *A* backward, reverses the above motions. That is, top clamp *F* recedes, side clamp *B* opens and wedge rod *C* is locked in open position by a suitable catch. By touching the ejector lever *G* the lower end of the brake shoe is lifted over the end stop and slides out. A new workpiece is then fed in from the top.

This machine can be operated as an automatic or semi-automatic unit as desired. The automatic cycle includes rapid advance, controlled feed, rapid reversal out of the cutters and 180 deg. indexing. In the semi-automatic cycle, the work rapidly approaches the cutters, feeds, rapidly returns and then stops just before indexing. In this case, resumption of operations requires pushing the clutch into engagement by means of the handle *H*. If the operator is ready in time, he places his hand on handle ball *H*, exerting a slight forward pressure; the machine will continue for the rest of the cycle and then repeat. The change from semi-automatic to full automatic is made by tightening thumb screw *J*.

A safety device is provided which disengages the feed clutch before the work enters the cutters if, for any reason, the index fixture is not locked in correct position. When this occurs, the operator moves the fixture to the correct position where it locks automatically. Then, by engaging the feed clutch, operation begins. Production is 230 brake shoes per hour.

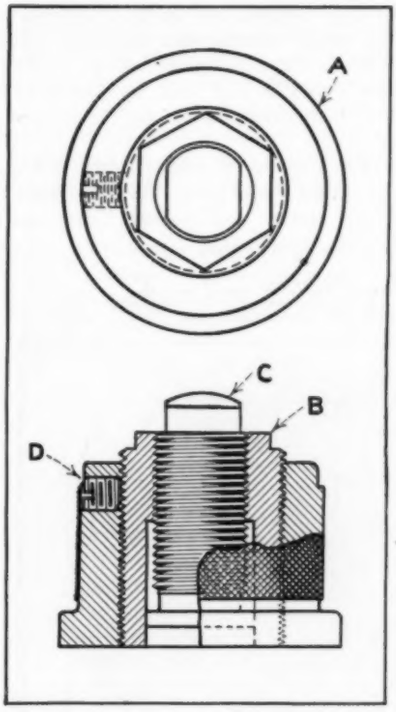
Ideas FROM PRACTICAL MEN

Telescoping Screw Jack

JOHN A. HONEGGER

Work on both the milling machine and the planer must often be supported in several places to prevent it from springing either from clamping pressure or from pressure of the cut. Sometimes the under part of the work is so close to the table that ordinary machine jacks will not go under it, and it was for such cases that the illustrated telescoping jack was designed.

The jack consists of the knurled and internally threaded base *A;* the externally and internally threaded sleeve *B;* the jackscrew *C;* and the locking screw *D*. The outer end of the sleeve is hexagon and the outer end of the jackscrew is flatted on two sides so that wrenches can be applied. For work within its range, the jackscrew only is used, the sleeve being locked by the locking screw, which has a shoe under it to protect the threads on the sleeve from injury. For work that the jackscrew alone will not reach, both it and the sleeve are screwed out, increasing the height.



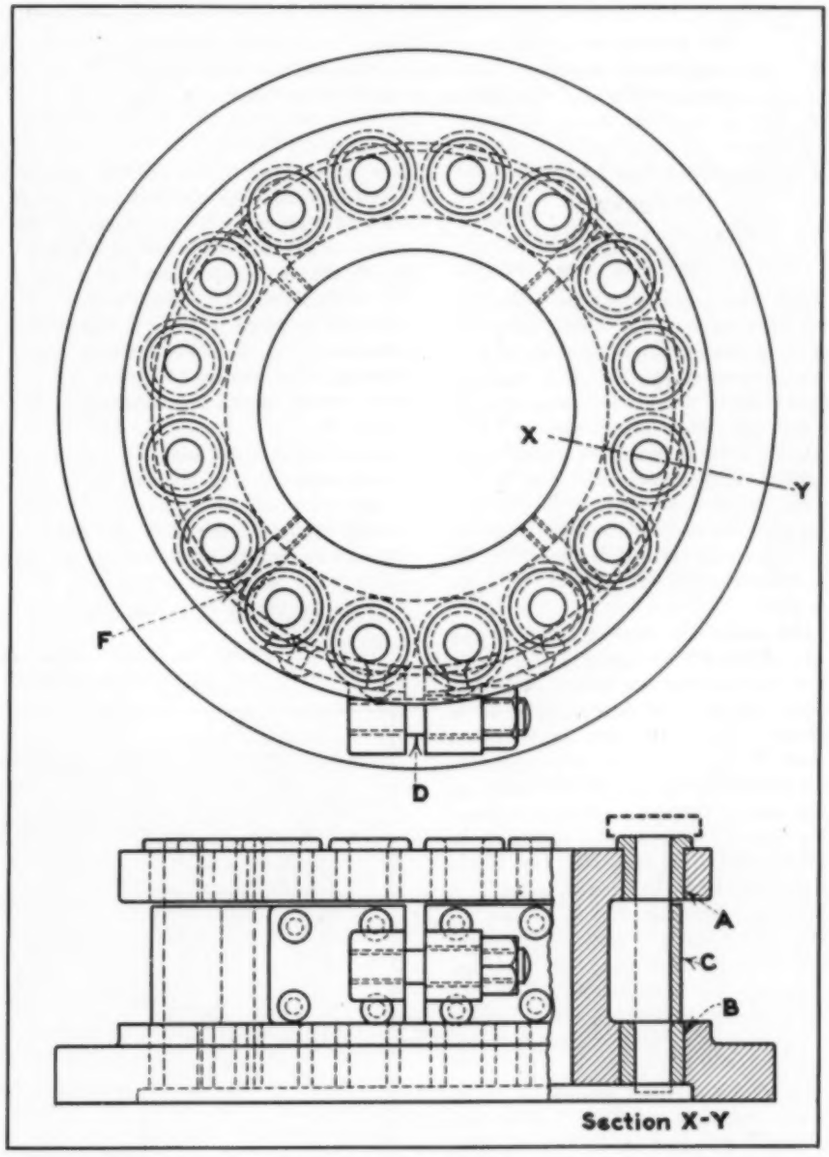
When collapsed, this telescoping jack is lower than the ordinary machine jack. It can be extended to full height by screwing out both the jackscrew and the threaded sleeve

Grinding Fixture for Mushroom Tappets

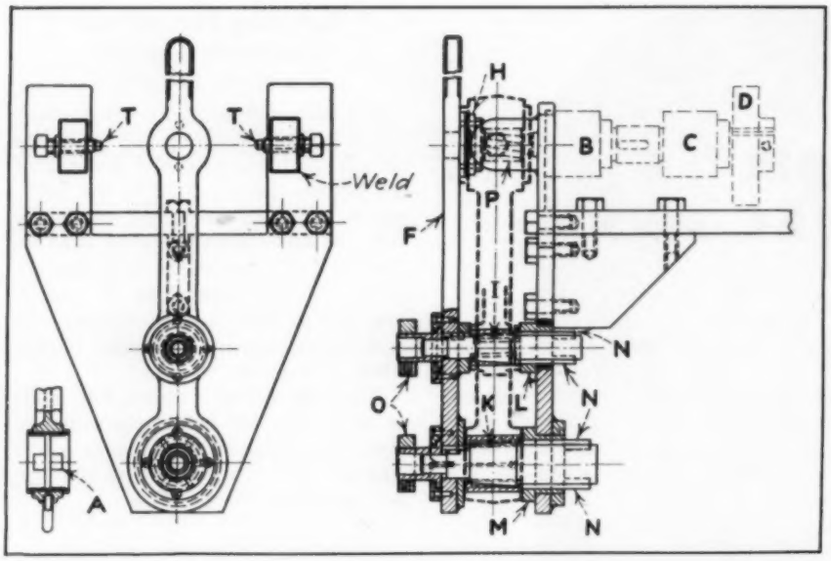
EDWARD L. PETERSON

The fixture illustrated is for grinding the mushroom ends of valve tappets for automotive engines. The stems of the tappets are a slip fit in the bushings *A* and *B* in the flanges of the fixture and are held by the steel band *C*. The band has lugs at the ends through which the tightening bolt *D* passes. The fixture holds sixteen tappets and is mounted on the faceplate of the grinding machine.

When the fixture is empty, four studs as at *F* keep the band approximately concentric with the fixture so as not to interfere with the entrance of the tappet stems into the bushings.



The stems of the valve tappets pass through the bushings in the flanges of the fixture and are held by tightening a steel band around them



Oil pockets are milled in the crankpin bearings of connecting rods in this machine. The rods are located on pilots in the work holder and the milling is done by oscillating the rod

Machine for Milling Oil Pockets

CHARLES C. TOMNEY
Chief Tool Designer,
Carrier Engineering Corporation

The illustration shows the operating part of a machine for milling oil pockets *A* in the crankpin bearings of two sizes of connecting rods. The machine is portable so that it can be moved out of the way when not in use.

A sleeve for carrying the cutter arbor is fitted to the bearings *B* and *C*, the shank being turned to fit the driving gear *D*. Power is transmitted from an electric motor through a pinion on its armature shaft meshing with the driving gear.

The work is located on pilots in the work holder *F*, the upper one *H* being short and having two steps, each step fitting the crankpin bearing of a rod of different size. The two lower pilots *I* and *K* are provided with expansion bushings to fit the piston pin bearings. Only one of the lower pilots is in place at a time. If the smaller rod is to be milled, pilot *K* is removed, and if the larger rod is to be milled, pilot *I* is removed. Bushings *L* and *M* are for guiding the straight ends of the taper plugs used for expanding the bushings. The plugs are each provided with two diametrically opposite keys *N*, which engage keyways in the guiding bushings.

To load the work holder, it is removed from the machine and a connecting rod is put on it, the crankpin bearing fitting over one of the steps on pilot *H* and the piston pin bearing over one of the lower pilots *I* or *K*, according to the size of the rod and which one of the pilots is in place at the time. Then the hand nut *O* is turned until the expansion bushing is tight in the bearing. The work holder with the rod in place is then put into the machine, the keys *N* sliding clear through their keyways to bring the rod into correct location in relation to the cutter *P*.

Everything now being in readiness, the operator grasps the handle at the upper part of the work holder and oscillates the holder and the rod between the two adjustable stops *T*, the lower pilot acting as a fulcrum, thus causing the cutter *P* to mill oil pockets in both sides of the bearing to a depth controlled by the adjustable stops.

Unless the keys *N* have passed entirely through the keyways in the bushings and clear the ends of the bushings, the work holder can not be oscillated. This is a safety measure to insure that the rod is in correct position in relation to the cutter before milling.

Above-Center Turning Tools

FRANCIS W. SHAW
Whitworth, Lancashire, England

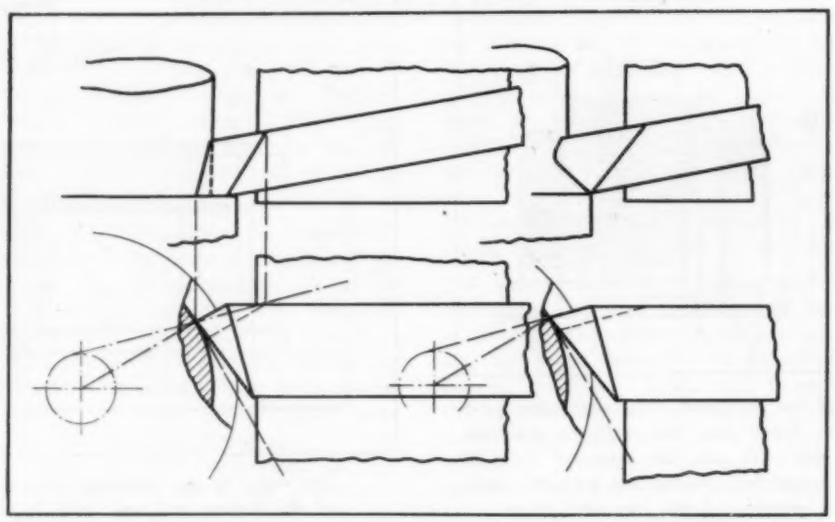
The illustration shows the tooling system for a special-purpose lathe, the object being to simplify tool form and grinding.

The cutting point is located well above the axis of the work so that the cutting face can be ground by passing it straight across a grinding wheel, as can also be ground the end and the side clearance surfaces. As will be seen, the tool, as it is sharpened, maintains its initial shape, only growing shorter. If tools are reserved for individual jobs, height adjustment is avoided.

The left-hand view illustrates a side-cutting tool, the cutting face being radial, though it may be tangent if desired to some circle as shown by the broken line. The right-hand view is of a similar roughing tool which may have its cutting face radial if desired. The radial construction increases the length of cutting edge in action for the same depth of cut and, in theory at least, somewhat increases the tool's life.

Where tools of other types need never be employed, the toolrest slides, never too strong, can be thicker.

Tools set above center and ground radially need not be adjusted for height if reserved for individual jobs



Drilling a Hole Deeper Than the Length of the Drill

J. T. TOWLSON
London, England

Referring to an article by Malcolm K. Parkhurst under the title given above (*AM*—Vol. 79, page 330), just at the time the screwdriver is to be applied to the drill, the flutes of the drill have been buried in the hole, and its shank is blocking the exit of the chips.

In a drilling operation, where the flutes of the drill are buried in the hole, it is necessary to withdraw the drill at short intervals to clear the chips from the flutes, and the deeper the hole, the shorter the intervals.

This being the case I would like to know how Mr. Parkhurst proposes to withdraw the drill. I don't see how it can be done. The only way to drill a hole deeper than the length of the drill is to sweat an extension on its shank. Then with care and by withdrawing the drill at short intervals and cleaning the chips from the flutes, the drilling can be done.

Convenient Set of Clamping Devices for Faceplate Work

SAMUEL GAHAN

Fig. 1 shows a tray containing all the straps, bolts, nuts, washers, extension pieces, blocks, jacks and wrenches necessary for mounting almost any job on the lathe faceplate. This set has been in use in an industrial high school for about six years and is light enough to be carried by a boy from the toolroom to the lathe. Parts that are seldom used, such as jacks over 2¼ in. high, are not in the tray, but are kept in the toolroom to avoid making the set too heavy.

The arrangement of the articles in the tray is intended to make instant inspection possible; thus if a strap should be badly bent it would not fit in the compartment with its mate. If it should be slightly bent, the bend could easily be seen from the way the straps fit together. The washers are stacked on the extension pieces back of the bolts. The nuts and the washers are case hardened, but the bolts are left soft, so that if the threads are injured a die can be run over them. The small tray *A*, which holds a center indicator, fits in the space *B* and prevents the bolts from falling out. The straps are not case hardened because they are sometimes used on the milling machine and we do not care to take chances of ruining a cutter by having it run into them.

With the extension pieces, bolt lengths of from 2 to 6½ in. can be obtained, varying by increments of ½ in. By this means, long and dangerous projections of bolts from the nuts is avoided. With the blocking pieces, heights of from ⅛ to more than 1 in. can be obtained. From there on the jacks are used.

In mounting work on the faceplate that is out of balance, we use sectors cut from lead rings for counterbalance weights. We cut off a sector of about the right weight with a hacksaw and drill holes in it for the bolts for attaching it to the faceplate.

In Fig. 2 is shown the holder for the bolts and the extension pieces. It is made of cold-rolled pieces riveted together and to a bottom plate.

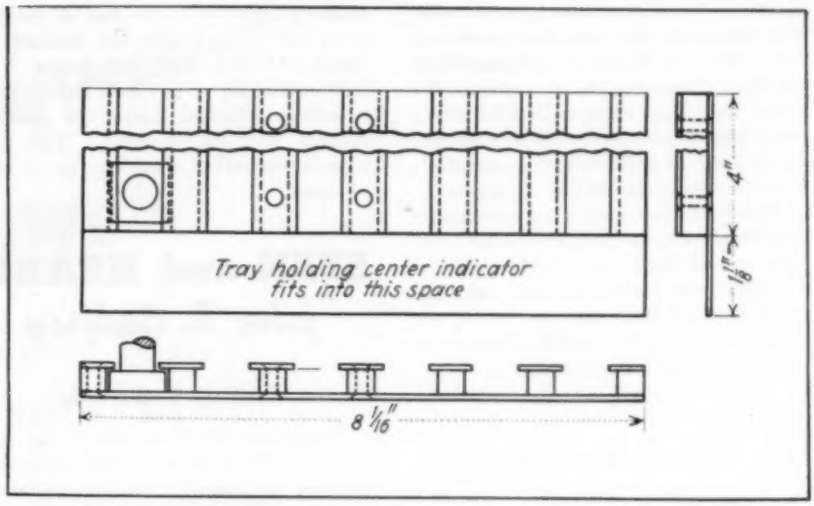
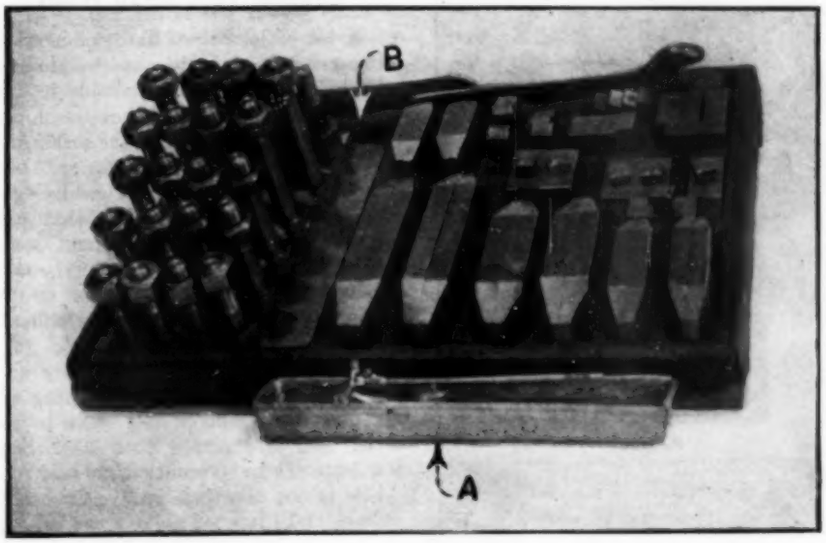


Fig. 2—The holder for bolts and extension pieces, made of cold-rolled steel riveted together and to a bottom plate, fits in the end of the tray

Fig. 1—This tray holds all the straps, bolts, nuts, washers, extension pieces, blocks, jacks and wrenches necessary for mounting almost any job on the lathe faceplate



Repairing a Press Frame

L. KASPER

While the method described by William C. Betz (*AM*—Vol. 79, page 598) is good and may serve the purpose for a long time, there is one point that is worth mentioning. That is that the possibility of failure is proportional to the tensile strain to which the rods are subjected by tightening. And in the event of failure, injury to the operator is not only possible but also quite probable.

In the shop where I am employed there are a number of presses fitted with 1¼-in. tierods for stiffening the

frames. On a particularly severe job the tierods on one press were drawn up very tight to eliminate the possibility of the frame springing. After the press had been in operation for some time, one of the rods broke under the upper nut and fell on the operator's foot, resulting in serious injury.

Now, all the tierods on our presses are fitted with collars above the bottom tierod bosses, so that in case of breakage the only part that can fall is the short end that is below the collar, the weight of which is not great enough to cause serious injury.

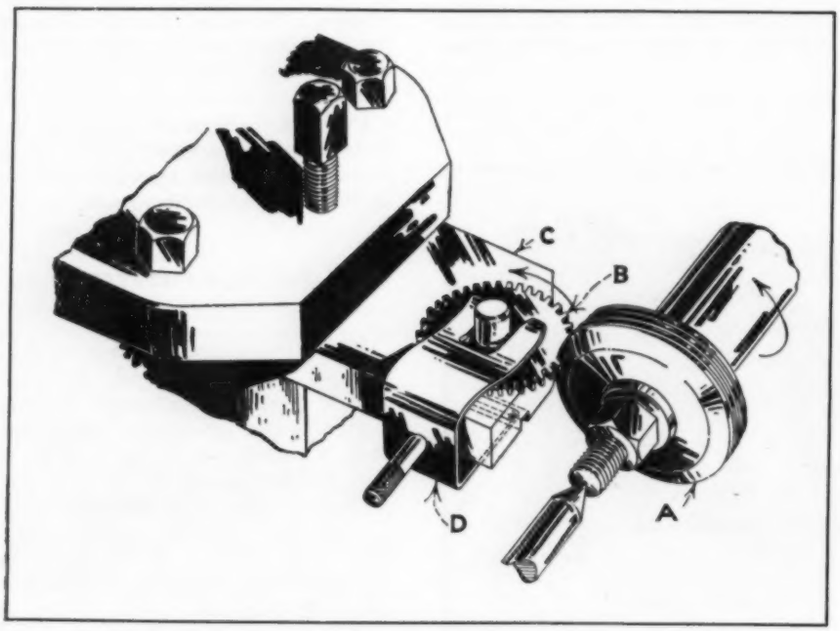
Lapping Small Gears

PHIL. E. VERAA

In the manufacture of aviation instruments, the small brass gears used are tested in assembly for concentricity and accuracy of tooth spacing. Lapping the teeth is often necessary to reduce friction and to remove high spots.

The illustration shows a method of lapping such gears. The lap *A* is made of boxwood and is approximately 3/8 in. thick. Boxwood is used because it is remarkably hard and has a fine, compact texture. A worm thread is rough-cut on the lap and the correct tooth form is then generated by revolving it against a steel gear of the same pitch as that of the gear to be lapped.

The lap is mounted on a mandrel held between the centers of a watchmaker's lathe, and the gear *B* rotates on a pin pressed into the bracket *C*, which is held in the tool clamp. The light spring *D*, of flat steel and having a handle attached, keeps the gear in contact with the bracket. The lapping compound is a mixture of oil and alumina.



The gear rotates on a pin pressed into a bracket held in the tool clamp of a watchmaker's lathe, and the lap is a boxwood worm

SEEN and HEARD

John R. Godfrey

Feeding Backwards

Forgetting details is one of the easiest things in the world. And it's almost as easy to remember a lot of things that never happened. That's one thing that makes it so difficult to get correct history unless written records are available. And unless these were made at the time and unbiased even they are apt to be misleading. As an example, take the first J. & L. flat turret lathe. Most old timers remember the odd appearance of the turn table turret (or horizontal face plate) with tools bolted to it. But how many recall the early practice in turning long, slender work? The work was necked in close to the chuck where it was well supported, and a roller steady rest put on the turned part. Then the tool was fed "off" the work, toward the tail-stock—if there had been any. Few old J. & L. men remember this, but it is given in the first description of the machine in the *American Machinist*, May 7, 1891.

Diamond Boring

As an example of the way names cling, even when they cease to be correct, take what we call "diamond boring." Originally it was a perfectly proper designation when it was applied to the use of diamond-tipped tools. But the growing use of carbide tips on single point boring tools has replaced the diamond in many places. Yet, many continue to call all single point boring operations "diamond boring." Much confusion results because diamonds are still used on some operations, especially in cutting non-ferrous alloys. It is high time to stop this. Let's use the term "single point" for all work where a diamond is not used. Then the use of the term "diamond" designates the kind of tool used. If we want to be really fussy about it we could say single point in both cases, and add carbide or diamond, according to the one used.

Round Columns and Ways

Every so often some designer gets the urge to use round bearing surfaces for longitudinal motion. Ground shafting for lathe bed ways, either singly or in pairs, has had many trials. Some, as in the Amalgamated shell lathes, were very successful. But round surfaces have not been confined to shafting or to lathes. At the tail end of the last century Forbes built some very interesting milling machines with round columns, in his shop in Hoboken. The saddle bearing clamped around the round base. Radial drill columns are still round in many cases. But in most cases designers go back to flat or V-ways for one reason or another. It may be getting time for another epidemic of round surfaces.

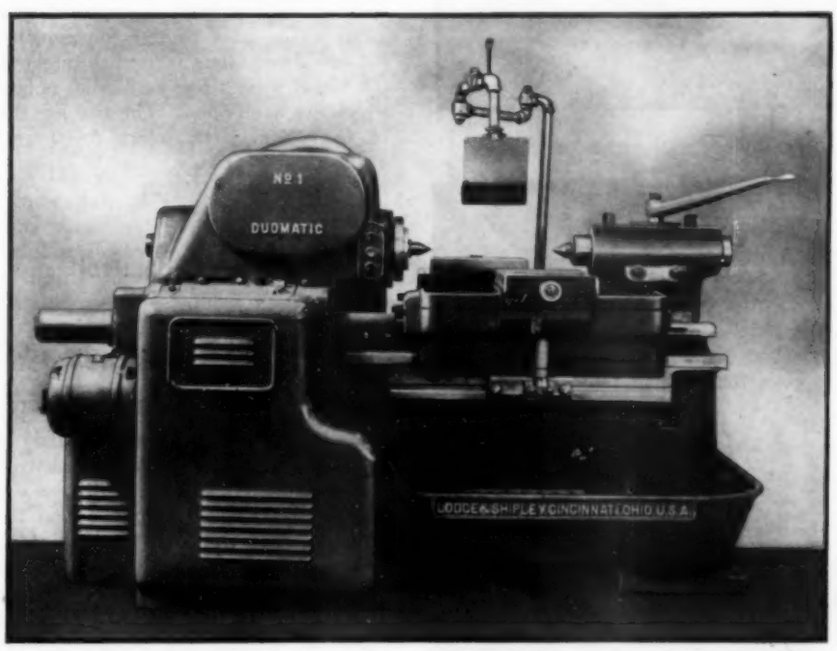
Drilling Very Small Holes

A lot of jobs seem hard, or next to impossible, simply because we do not know what tools are available in the open market, or the technique of the operation. Such a job is the drilling of very small holes from 0.006 to 0.012 in. in diameter. Given a good, high-speed, sensitive bench drill that will run from 7,000 to 10,000 r.p.m., some jewelers' drills that can be bought cheaply, an operator with a steady eye and hand and it is not a difficult job.

The work must be held firmly and in proper position. A good cutting oil, and a strong magnifying glass, to see that the drill gets a good start, help a lot. These precautions, where the hole is not over four or five diameters deep, make it a simple job.

Shop Equipment NEWS

Lodge & Shipley Nos. 1 and 5 High-Speed "Duomatic" Lathes

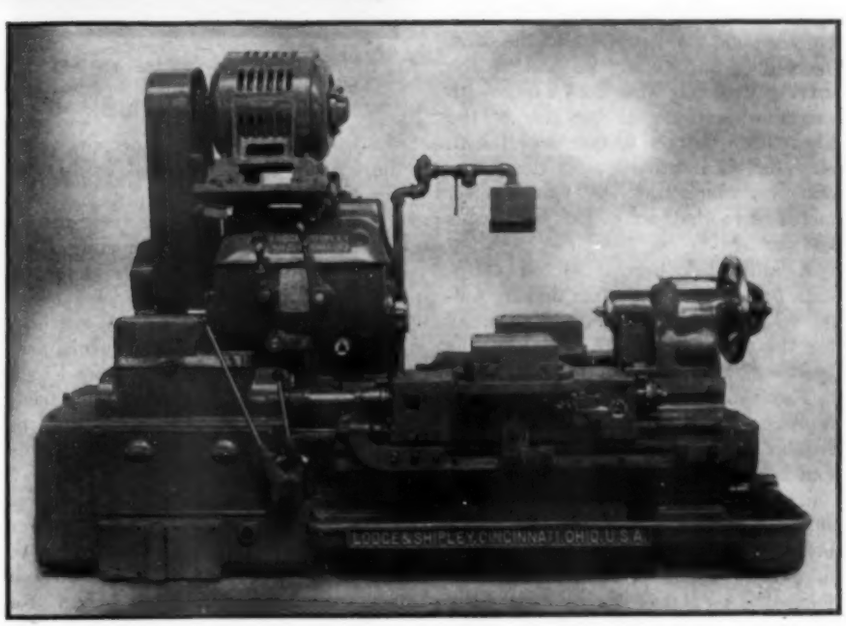


The No. 1 Duomatic is a highly specialized tool for high-speed quantity production of the smaller class of work pieces. This lathe, introduced by the Lodge & Shipley Machine Tool Company, Cincinnati, Ohio, reduces the non-cutting time of the tools in order that profitable automatic lathe production can be maintained. Electrical tool control for the rapid handling of the tools' idle moves is the first factor in speeding up the work. A power traverse brings the tools from the out-of-the-way loading position to the ready-to-cut work position by high-speed motors. A definite relation exists between the feed and the r.p.m. of the work piece, since the feed is powered by means of a gear on the headstock spindle and all feeds are accurately measured in thousandths per r.p.m. of the spindle.

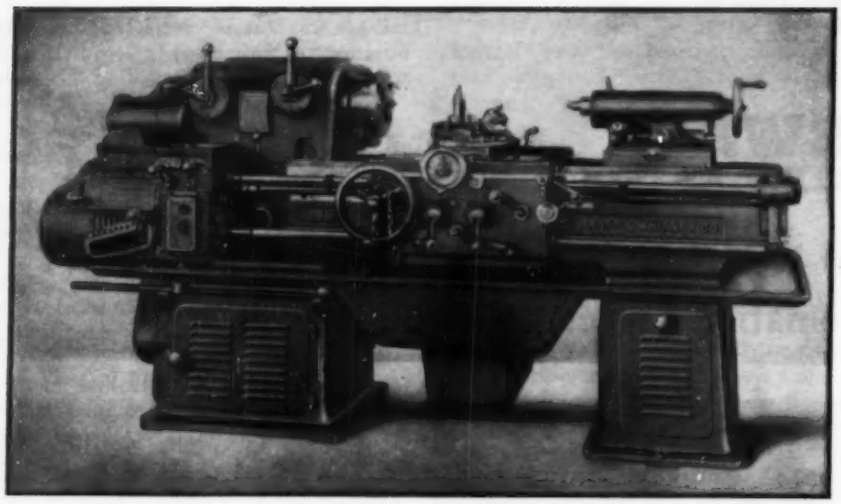
All electrical control is a distinctive feature of this machine. Levers for starting and stopping are eliminated. After loading the machine, it is started by means of a push-button station. When the cut is completed the tools return to their starting position and the entire machine, including the work spindle, stops automatically. The all-electric feature also includes push-button controls for stopping and reversing, which may be used at any time either during rapid traverse or feed, time savers when setting up the job and valuable safety features.

Regular equipment includes: quick clamping, lever operated tailstock with built-in revolving center; pan; motor-driven coolant pump; piping; splash guards; front and rear traverse motors; all necessary control equipment for traverse and main drive motors; and self-contained multi-V-belt motor drive, exclusive of the main drive motor. Recommended motor rating is 5 to 15 hp., 1,800 r.p.m.

The company's No. 5 Duomatic is a heavy-duty machine. Hydraulic tool control has been built into this machine to accomplish the results needed on heavy work. Because of the infinite variety of uniform feeds provided by the hydraulic system, it is possible to obtain the correct feed for any particular job. Feed can be automatically changed during the cut as the section of the cut varies. In this way the machine can be kept at all times at the peak of its metal removing possibilities. The hydraulic feed is smooth, quiet and instantaneous in action and has a cushioning pressure which prolongs the life of the cutting tools and the machine.



Pratt & Whitney Model C Lathe

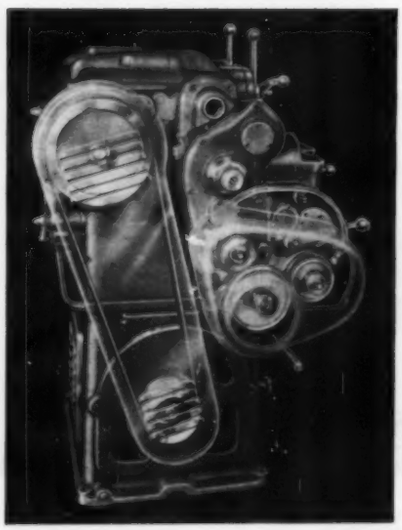


A simplified machine incorporating accuracy, rigidity and convenience, the Model C lathe, introduced by the Pratt & Whitney Co., Hartford, Conn., is available in two sizes, having 14- and 16-in. swings. Each size can be had in two lengths, giving center to center capacities of 30 and 54 in. for each swing.

Constant-speed driving motor is mounted on a hinged platform within the cabinet leg. A multiple V-belt drive carries power from this motor to the main driving pulley at the rear of the headstock. Headstock gearing produces eighteen spindle speeds, ranging in geometric progression from 14 to 1,000 r.p.m. Bed and headstock have been built out, forming what is known as the "column headstock." It provides a rigid solid support to the driving pulley and takes the pull of the driving belt. It also does away with excessive overhang at the rear of the headstock. Larger surface area for an oil reservoir is provided by this built-out construction. A Cuno filter mounted in the rear of the bed cleans the oil.

A multi-disk driving clutch transmits power from the main driving pulley to the headstock gearing. Control for this clutch is on the front of the headstock and also on the apron.

The spindle of the Model C lathe represents a different design from the regular lathe practice. It is heavier and is supported at three points. Front and middle bearings are pre-loaded super-precision ball bearings. Rear bearing is of the roller type. Spindle nose is of the new Type D-1 and is flanged. A camlock device, instead of the usual screw threads, permits spindle chucks to be mounted easily and accurately.



Phantom view showing gearing and built-out headstock and bed

A set of ratio gears provides for 60 quick changes of speed ranging from 0.003 to 0.188 in. It also provides for 60 quick thread changes from 1 to 60 threads per in., inclusive. A synchronizing high-speed clutch mechanism has been incorporated in the headstock for reversing the leadscrew and feed-rod drive. This makes it possible to reverse the carriage at higher speeds without stopping the lathe.

Quick-acting levers for positive clutch speed engagement are used for both longitudinal and traverse travels. Longitudinal feed is through a rack and pinion with a handwheel for manual operation. Traverse speed is through a large-diameter feed screw and also has a large handwheel for hand operation. The apron carries the leadscrew nut lever, the carriage reverse lever and a built-in thread chasing dial.

The same quick-withdrawing mechanism for thread-cutting which has been known in the Model B lathe is incorporated in the new machine. Compound rest is of similar design, having its handwheel elevated at an angle for knuckle clearance. Tool slide is a steel casting to prevent breaking out the T-slot under heavy pressure. The binder which releases the carriage cross feed for taper attachment operation, instead of being operated by a wrench, is operated by a lever which adds to the convenience.

Centralized oiling is used throughout the lathe, with a few additional points which are hand-oiled. The two lengths of the 14-in. lathe weigh 3,700 and 4,000 lb., respectively. The 16-in. sizes weigh 4,000 and 4,300 lb.

Thermo "Capacitrol"

The pointer of the galvanometer in the "capacitrol" announced by Thermo Control Devices, Inc., 1112-14 Milwaukee Ave., Chicago, Ill., has no mechanical work to do to cause the relay to function. The method of operation of the Wheelco capacitrol, an indicating control pyrometer, or signal light indicator, is based upon the function that the plate current of an electron tube in oscillating condition is positioned by the amount of grid excitation it receives. This current is used to actuate the sensitive relay containing a mercury tube. Scale ranges of this instrument are 0 to 400—800—1,200—1,600—2,000—2,400 and 3,000 F. Dimensions of this unit are $10\frac{1}{4}$x$10\frac{1}{4}$x$10\frac{1}{2}$ in. deep.

Mechanical contrivances are eliminated by the use of a vacuum tube

Rockwell Model P Dilatometer

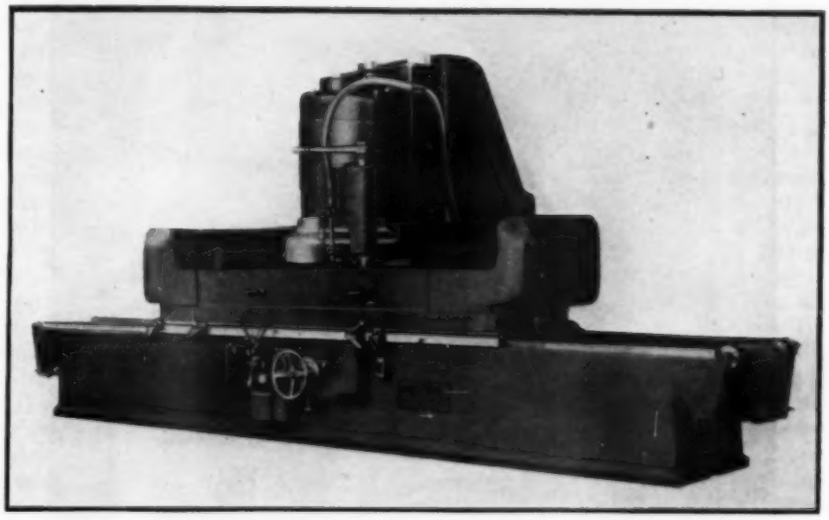
A dilatometer in its simplest form, the Model P instrument, announced by The Stanley P. Rockwell Co., Hartford, Conn., consists of a frame, lever and dial with the necessary quartz feeler rod and simple screw adjustment. It is indicating and non-recording. It finds its greatest usefulness as an extra control, insurance and guarantee of good hardening of tools and dies. It may be used with a great range of existing oven and pit-type tool-hardening furnaces and will indicate precisely the beginning and end of the steel transformation.

As the steel changes volume or length with heating, the gage is immediately actuated, and the movements of the gage pointer represent the mechanical equivalent of the temperature of the steel at the moment such temperature change occurs. Rapidity of movement of the gage pointer further gives an indication of the rate of heating of the steel.

The Rockwell Model P. Dilatometer consists of a cast-iron crackle finish frame, holding a lever which actuates a four-inch face dial. Lever is actuated by either a quartz tube or in some cases a Nichrome tube, which extends from the lever to a hole in the arch of the furnace and rests on the steel to be treated. Expansion or contraction of the steel furnishes the motive power to actuate the dial. Adjustment for different sizes of steel, tools and dies to be treated is made by a threaded extension of the tube through the lever. The tube is advanced one inch per ten turns by turning a fiber handle. Overall dimensions of the instrument are 9 in. wide, 17 in. long and 18 in. high.

This dilatometer may be used with a great range of existing oven installations

Hanchett Vertical Spindle Face Grinder

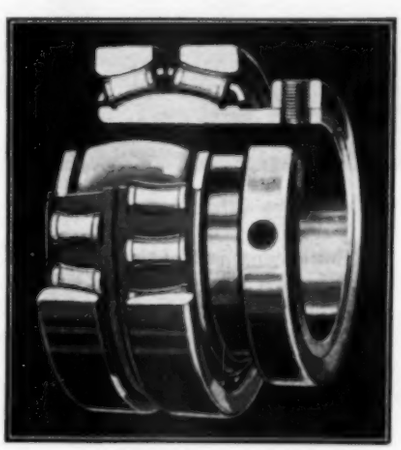


Designed for grinding a variety of flat surfaces, the No. 400 series vertical spindle face grinder, announced by the Hanchett Mfg. Co., Big Rapids, Mich., permits the grinding of surfaces when it is desirable to have the work lie flat instead of on edge. Work to be ground is held by magnetic chucks or fixtures attached to the finished table top and passed beneath the grinding wheel at speeds ranging from 0 to 90 ft. per min.

Ability to adjust the built-in grinding wheel head so that the spindle is exactly at 90 deg. with the table makes it possible to hold to very close tolerances without sacrifice in production rate. The machine illustrated shows a built-in motor drive, but the machine is also made in belted-motor-drive type.

Grinding wheel chuck is a 22-in. segmental type, holding abrasive blocks 6 in. high by 2½ in. face. Red Anchor cylinder wheels 22 in. in diameter or 20 in. in diameter by 4 in. high can also be supplied. Built-in motor control is available in alternating current only. Full automatic and pushbutton control is provided.

The wheel spindle has diameters of 4 in. in the bottom bearing and 3 in. in the top bearing. Precision spindle, preloaded type bearings are used. Wheel head may be raised either by hand or power. Table ways are one flat and one V, both 4 in. wide and 19 in. center to center. Pressure lubrication is provided throughout. Ways are protected by the company's patented belt covers.

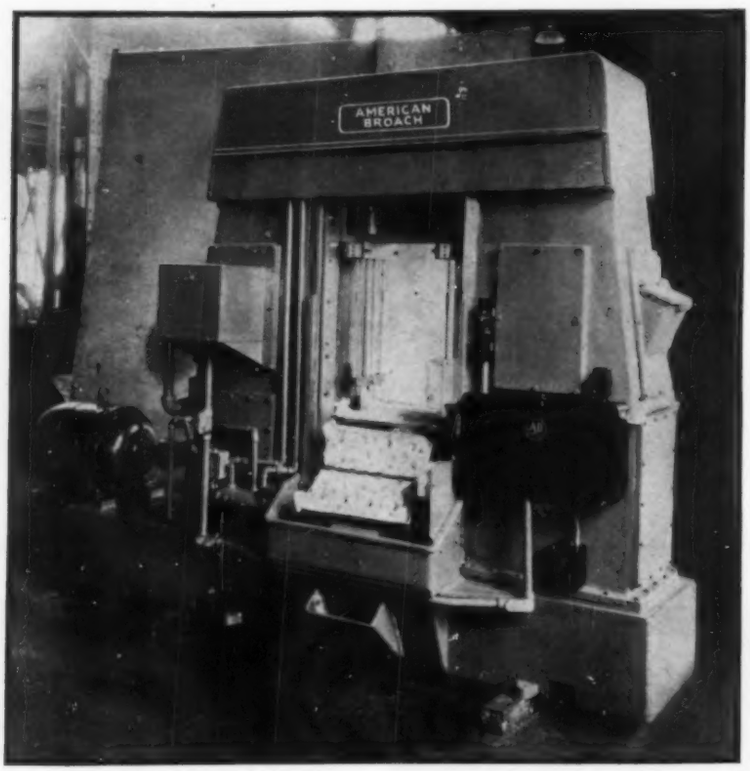


Link-Belt Self-Aligning Roller-Bearing Unit

Ability to carry radial, thrust and combination radial and thrust loads and inherent self-alignment are the advantages claimed for the Shafer self-aligning roller-bearing "Series 400" announced by the Link-Belt Co., 910 South Michigan Ave., Chicago, Ill. These units are available for pillow blocks, flanged bearings, hangers and take-up.

Self-alignment of the Shafer roller-bearings is provided by concave rollers between convex outer races and spherical inner race on the sleeve, which is free to deflect with a shaft temporarily misaligned or out of line because of inaccuracies of installation. Labyrinth seals protect the bearings. Bores are ground for direct shaft application.

American Vertical Broaching Machine



Designed for broaching elongated holes in aluminum cylinder heads used in a V-8 engine, the vertical continuous broaching machine, announced by the American Broaching Machine Co., Ann Arbor, Mich., is of the push-broach type. Four holes are broached at one time, and two pieces are completed every 14 sec. Table is the revolving type, hexagon shaped. Two cylinder heads are mounted on the side next to the operator, as the two top members are being broached. Upon completion of the broaching cycle, the drum-type table indexes automatically, discharging the two previously broached heads.

As the operator places two cylinder heads, one right and one left, on the loading side of the revolving table, the heads are dropped on two locating dowel pins. Automatic indexing brings the two parts into the top position ready for broaching. Hydraulically operated clamping bars advance and hold the heads in place. Holes are then broached and burnished, the cutting section of the broach being followed by a series of burnishing teeth. Upon completion of this stroke, the machine goes into reverse, withdrawing the broaches back through the hole. The burnishing part of the broach having increased the size of the hole, allows the broach to pass through without riding the cutting edges. When the broach withdraws to its upper position, the clamping bar automatically lifts and the drum table indexes for the next two cylinder heads.

This machine is constructed along the lines of the standard American vertical broaching machines, having two vertical columns of heavy ribbed section, fitted with hardened and ground tool steel way caps and equipped with a cylinder which has the slides integral. The stroke of the machine is 24 in., and the broaches used are approximately 18 in. long.

Udylite Ball Anodes

The Udylite Co., Detroit, Mich., announces that ball-type anodes (*AM*—Vol. 76, Page 1081) are now available for copper, brass and zinc plating. Advantages claimed for the ball anode are as follows: maintains constant anode area, eliminates scrap losses, convenient method of anoding, and less investment in anodes required to equip plating tank.

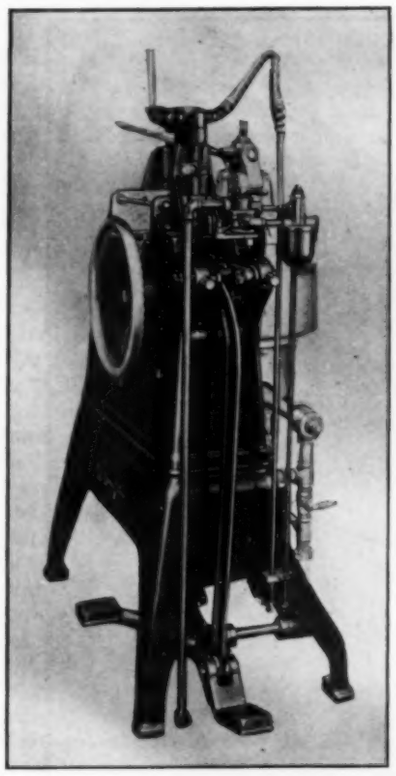
"TEC" Center Dope

"TEC" center dope, announced by The Equipment Co., 11246 East Vernor Highway, Detroit, Mich., is a heat-resisting lubricant for use on lathe centers, grinder centers and milling machine arbor centers. Under test, this lubricant withstands frictional heat well, and eliminates dangers of infection common to white lead preparations. It is applied in a thin film so that the danger of concealed chips is removed. It will not harden.

Linde Acetylene Generator for Medium Pressures

Developed for portable or stationary use with any type of oxy-acetylene, cutting or welding apparatus, the medium-pressure generator, announced by the Linde Air Products Co., 205 East 42nd St., New York., N. Y., is known as the "Oxweld" Type MP-6, has a 50 lb. carbide capacity with a double rating of 100 cu.ft. of acetylene per hour.

A handwheel at the generator top makes it possible to control the carbide feed so that acetylene at any desired pressure up to 14 lb. per sq.in. may be obtained. The carbide feeding mechanism incorporates the same principle of gravity type, pressure diaphragm control as the larger units made by this company. Special automatic controls are applied.



"Kippcaster" No. 315 Die-Casting Machine

Similar in construction to the company's No. 115-GF die-casting machine, except that it has an air gooseneck instead of a displacement-plunger type gooseneck, the No. 315 Kippcaster announced by the Madison-Kipp Corporation, Madison, Wis., is semi-automatic and fully pneumatic in operation. Pneumatic die-closing has replaced hand die-closing. Direct air-shock goosenecks are free from the uncertainties of plunger wear and plunger friction which are likely to introduce a variable from one casting to another.

Fire pot is gas-fired, and gas consumption varies with the size and type of casting work being performed. It does not exceed 260 cu.ft. of gas per hour. Water-cooling is used on most dies, and solidification is rapid.

Lithoform Protective Coating for Galvanized Iron

With the development of "Lithoform" by the American Chemical Paint Co., Ambler, Pa., the problem of making paint stick to galvanized iron and galvanneal has been solved. Coating provided by Lithoform will not wash off, it will not chip or corrode and is not affected by baking temperatures.

Shaw-Box Drop Pit Table

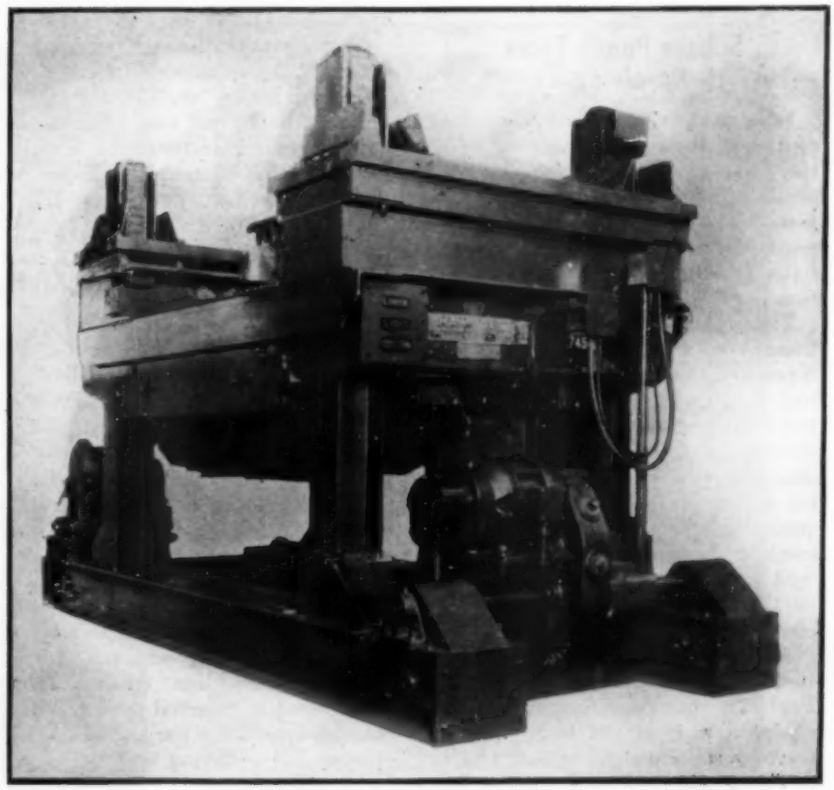
Permitting economical maintenance of locomotives at divisional back shops or roundhouses, the special purpose electrically operated machine, known as a drop pit table, is constructed entirely by arc welding by the Shaw Box Crane & Hoist Company, Inc., Muskegon, Mich. The unit is built in both movable and stationary types for removing and replacing locomotive drive wheel sets, engine and trailer trucks.

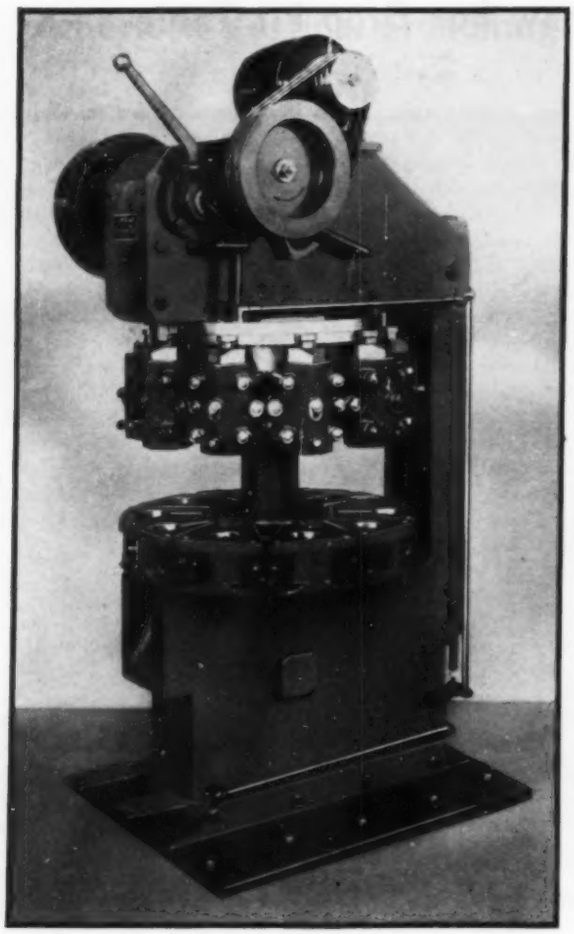
Three independent units make up the complete table, the truck, lifting table and table top. The lifting table is raised and lowered between its columns, mounted on the truck, by four drums and four flat steel flexible cables. Drums are operated simultaneously by one motor through two duplicate gear drives. Table top is detachable and is equipped with locking bars and sections of rails to form a continuous track over the pit when locked in position. A feature of the design of this drop pit table is the use of four flexible cables and winding drums for raising the load, rather than the former practice of using jack screws. This feature permits the raising or lowering of the load without spotting accurately on the table top.

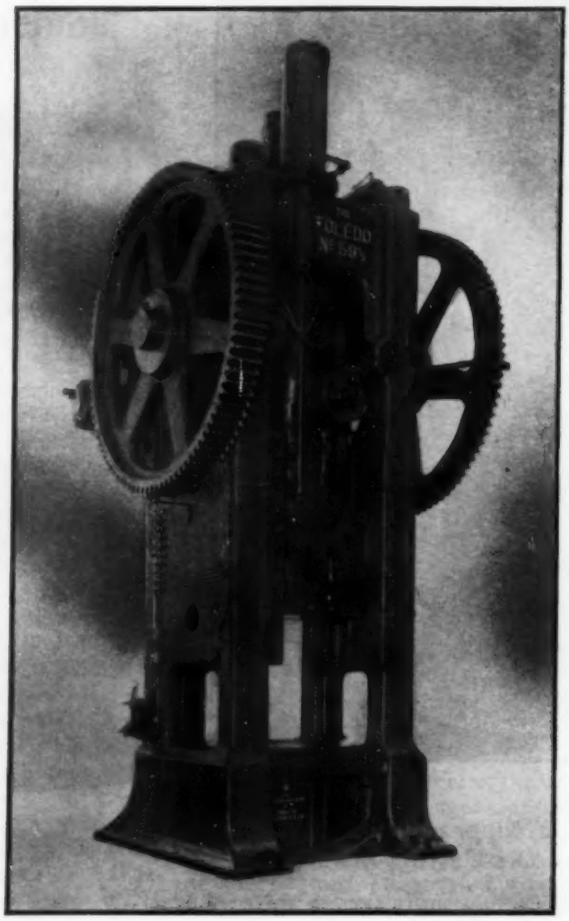
The unit is supported by four standard H columns carried on and welded to a base composed of two H columns welded integral with cross connecting members. Lifting table is also fabricated by welding. The welding is done with shielded arc equipment supplied by The Lincoln Electric Co., Cleveland, Ohio.

Use of arc welding and construction is reported to save approximately 15 per cent in weight. This is made possible by the elimination of intermediate connecting members and by the use of materials which provide adequate strength.

Operating advantages claimed for the new arc welded drop pit table are as follows: it will not bind or stick when loading is unbalanced because there is an equal pull at each corner of the table; water nuisance generally prevalent in pits is eliminated because there are no guides to destroy waterproofing in pit walls; the cost of maintenance is low because all gearing operates in oil baths in sealed inclosures; operation is safe; table is stopped by automatic stop when it reaches its highest or lowest position; there are no springs in the trucks to become fatigued and cause table to drag when traveling in the pit.







Schatz Punch Press With Revolving Turret

Equipped with a revolving turret containing from six to twelve slides or tool stations, the multi-tool punch press, introduced by the Schatz Manufacturing Co., Poughkeepsie, N. Y., practically eliminates spring in the frame by its rolled steel plate construction.

The turret is revolved by power transmitted from the main drive. By depressing the left treadle, the desired tool is brought into working position. Bed and slide tool surfaces have liberal dimensions for attaching punching, shearing, pressing, bending, straightening or forming tools. Upper tools have vertically adjustable guides, the adjustment of which permits them to be lowered sufficiently close to the lower dies so that in many cases strippers are eliminated.

A feature of this press is the ability to lower the upper tool onto the work. For this purpose, the machine is equipped with a pilot lever that also serves to set or match the tools rapidly.

This machine is made in five sizes, with pressure at the ram ranging from 17 to 130 tons, and with a throat depth of 8¾ in. for the smallest size, to 14¾ in. for the largest size. Strokes per minute range from 100 to 75, according to size. Unit motor drive is through multiple V-belts.

"Technical" Coating for Metal

Described as a combination of pure vegetable gums and heat-treated oils, the line of coatings introduced by Technical Coatings, Inc., 11 Park Place, N. Y., are said to form films which are free from porosity and impervious to water and corrosive atmospheric gases. These films are air-tight, water-tight, elastic and hard, and will not peel, chip, nor crack.

Primers with the non-porous base are available for various purposes. Application is by brush, spraying or dipping, after thinning with pure turpentine or high-grade mineral spirits. No linseed or other oil must be added, as this defeats the purpose of the non-porous base. Drying time varies from 4 to 15 hours.

Toledo Straight Column Press

Improvements in design and in the selection of proper materials are the principal considerations in the straight column press announced by the Toledo Machine & Tool Co., Toledo, Ohio. Care has been taken to obtain smooth lines and the absence of projections of any kind beyond the base of the press. The crown has been heavily reinforced, by making provision to extend the tie-rods through the top of the arch. Diameter of the tie-rods has been increased. The crankshaft is of the semi-eccentric type with an extra large crank pin and heavy cheeks firmly supported close to the frame of the press.

Bearing brackets have been eliminated by mounting the flywheel and clutch mechanism high up and out of the way between the uprights. Guards are furnished for the gearing. Floor space required has been reduced.

Clutch is of the air type mounted in the flywheel, having electric push-button control which enables the operator to stop or start the press at any point of the stroke or to inch the slide.

This press has a 16-in. stroke with a 6-in. adjustment by power. The slide is 24 x 35 in., and is counterbalanced by two air cylinders at the top of the crown. Bed area is 50 x 43 in. A direct-connected motor drives the press. Weight is approximately 150,000 lb.

Carter Crowning Apparatus

The Carter crowning apparatus, manufactured by Northill Co., Inc., 5728 Santa Monica Blvd., Los Angeles, Calif., offers an inexpensive and rapid method of crowning, forming and finishing any sheet metal, hot or cold, for limited production demands. Any desired crown or shape is produced by oscillating the roller across the work which is supported on the forming table. Three table forms are provided, a spherically concave bowl, a flat plate, and a reverse curve. For deep crowning, stretching rapidly to rough form is accomplished by working the material on a felt pad. Stretching by this method is uniform in all directions and it is impossible to tear or distort the metal or destroy the original mill finish.

The Carter Crowner is also used for finishing or planishing drop hammer and rubber die roughings. It produces a smooth surface, bringing the work to a finished state by flowing the metal.

"Selfvulc" Rubber Compounds

The Self-Vulcanizing Rubber Co. Inc., 605 West Washington Blvd., Chicago, Ill., has developed a rubber compound, known as "Selfvulc", a protective material which can be easily and quickly applied to equipment of all kinds.

Selfvulc in either plastic or liquid form can be applied cold. It cures itself by exposure to the air without the aid of heat or pressure. In the plastic form, it is put on with a spatula, spreading knife or trowel and rolled smooth. In the liquid form, it is brushed, dipped or sprayed on like paint. In every case, however, it is necessary to use special binding mediums, as provided by the company.

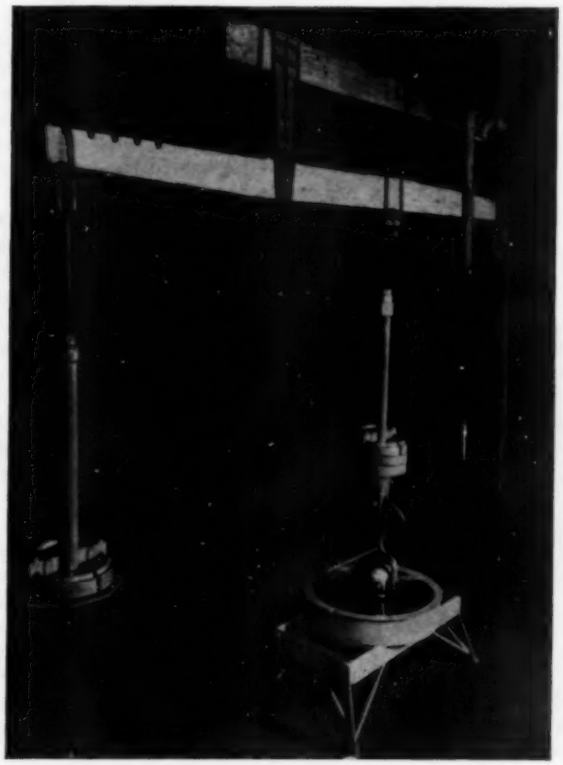
This compound of liquid rubber is 90 per cent pure gum. Since it is cold-cured, it will not harden, age, oxidize, crack or blister. It is inert and has no appreciable chemical reaction with acids or most other chemicals and does not contaminate foods. It withstands heat up to 200 deg. F., and cold to 120 deg. below zero, at which temperature its tensile strength increases 240 per cent. A coat of Selfvulc 0.001 in. thick will resist 440 volts. Liquid Selfvulc has a coverage of 150 sq.ft. to the gallon. It is available in unpigmented gray and with inert pigment in red and black.

Continental "Do-All" Sawing and Filing Machine

A dual-purpose machine, the "Do-All" band filing and bandsawing machine, announced by Continental Machine Specialties, Inc., 1301 Washington Avenue, South, Minneapolis, Minn., can be changed from one function to the other in less than 3 min. Inside sawing is accomplished by cutting the bandsaw blade, putting one end through the starting hole in the work, and then rewelding the saw blade in a self-contained electric brazing device. Inside filing is done by uncoupling the file band at a point where a "bayonet" type of joint is provided, and hooking the band together after it is inserted in the hole to be filed. The file band is not a flexible file, but is made up of 3-in. segments of files which are mounted on a flexible spring-steel band.

Since the cutting edge of the band travels in one direction, it provides ease of following lines, steady cutting, and the "back stroke" being eliminated increases cutting speed and saw life. A light is placed over the work.

The Do-All machine is made in two sizes, having capacities of 6¼ and 7½ in., respectively. While these machines find their most immediate application in tool and die work, they are equally applicable to a variety of uses.



Welding Manipulator

A welding manipulator, which permits positioning all work to be welded so that fillet welds of correct radius can be made without waste of electrode metal, and which permits savings of 25 to 40 per cent in welding time, is announced by the United Engineering & Foundry Co., Pittsburgh, Pa. This manipulator frees the overhead crane for other duties and eliminates the riggers which are necessary for crane handling.

The welding manipulator is portable and consists of a face plate operated by power supplied by electric motor of the "Linc-Weld" type. Operation is controlled by push buttons mounted on an extension cord. The face plate can be tilted or rotated to any desired position, the operator riding with the work. Only two handling operations are necessary when using the welding manipulator. These consist of placing the work on the face plate for welding and removing it after welding is completed. The capacity of this device is from 5 to 7 tons, depending on the center of gravity of the work being handled.

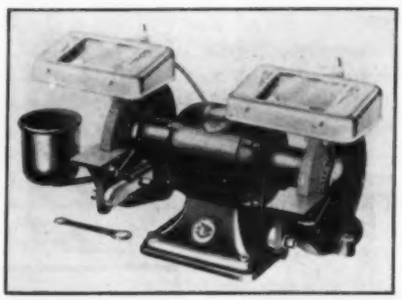
Reduced welding costs and higher quality welds are made possible by the welding manipulator. It can be tilted or rotated in any desired position, and the operator rides with the work, obtaining proper positions by means of push button control

Delta 7-In. General-Purpose Grinders

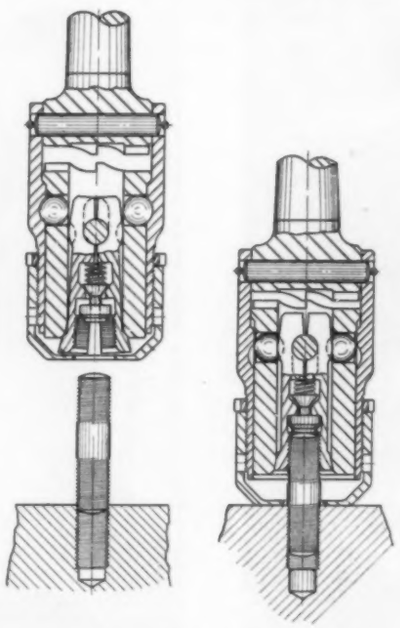
Designed to be completely self-contained, the line of 7 in. general purpose grinders, announced by the Delta Manufacturing Co., 620 E. Vienna Ave., Milwaukee, Wis., is offered in three models: a pedestal model for general machine shop and toolroom work, available with either single-phase or three-phase motors, a bench model with a single-phase motor, and a belt-driven model.

One of the features of the machines is the twin-light safety shield which not only protects the operator's eyes from flying particles of abrasives, but also incorporates a lighting system that makes the grinder completely self-contained, portable and independent of the shop lighting system. Each shield is equipped with a lamp bulb on each side of the safety glass shield. These lamps, while casting no glare in the operator's eyes, illuminate both sides and face of the grinding wheel. Lamps are connected to the motor switch so that they are on only while the grinder is in use.

Extended wheel housings provide plenty of room around the wheels for handling odd-shaped work. Tool supports are completely machined, to insure accurate setting.



Twin-Lite safety shield protects the operator's eyes from flying particles



Tool in open position and stud set to depth with driving clutch released

Modern Self-Opening Stud Setters

The Modern Style B self-opening stud setter, announced by the Modern Tool Works, Rochester, N. Y., is designed to meet the needs for a tool which combines speed and facility of operation, rugged construction and an ability to drive studs consistently without mutilation of threads. Open- or closed-end stop collars can be furnished.

This tool is guided centrally over the stud by means of a pilot hole in the stop collar. Jaws remain open until contact of the stud with the stud stop compresses the stud stop spring and brings the threads in the jaws into full register on the stud. At this point the balls are locked in the driving position and the driving clutch is engaged.

When the stud is set to within ⅛ in. of the height desired, the stop collar should be in contact with either the piece in which the stud is being set or the plate governing the height of the stud. The shell of the stud setter is thus kept from moving forward and the lead of the thread on the end of the stud entering the work disengages the clutch.

A feature of the Modern stud setter is the manner in which the drive is applied to the jaws. The drive is carried from the shank clutch through the driving clutch to a rectangular grip on the jaws at the lower end. In this way the jaws are relieved of torsional strain, giving them longer life and making it possible for the release to take place positively and smoothly.

The Round Table

OPEN HOUSE

"I've been looking around the shop a little, Al. It seems to me it's time we had a man to look after the toolcrib. Isn't it a bit careless to let the men help themselves?"

"It may look so to you, Ed, or to anyone coming in from the outside. But I'm not at all sure it would pay to have a man."

"It doesn't look like good business to me. Those tools cost money. They shouldn't be left lying around loose on the shelves with no one to watch them."

"It's not as careless as it looks, Ed. I'll admit there are many shops where it would be plumb crazy. But this is a small shop—we have a picked lot of men—and I can't figure where it would pay to put a man there. Most of our men work as though it was their own shop. They know their jobs —and when they need tools they know right where to find them."

"Do they always put them back where they belong? And what about keeping them sharp?"

"Those are fair questions, Ed. Of course, our men aren't angels any more than you and I. But they give mighty little trouble. If they were not all good men it would be a different story. Sharpening tools is another question. Few men really know how to grind tools unless they've been trained. So we don't even try to have them sharpened by the men who use them."

"What's the scheme then, Al?"

"When a man gets through with a job he leaves the tools with Jim Baxter; he's the only toolmaker we have. Jim looks them over and decides whether they need grinding or not. If they do, he grinds them the first chance he gets."

"What about such common tools as drills, taps and reamers?"

"That's a bit different. We aren't so fussy with small drills. They cost very little, and I figure it's cheaper to have a few spare drills near the man than to have a boy to deal them out."

"Don't the boys ever borrow them and forget to return them? I'd think it would be quite a temptation at times."

"Not enough to count. And when a lot of small drills get dull Jim grinds them up in batches. I figure that time wasted in going to a toolcrib will pay several times over for lost drills."

"Seems like a sloppy way to do business, Al. I'm a bit surprised because I thought you had more ideas about system. Do you know anyone else running a shop that way?"

"I used to be full of system, Ed. I'm getting over some of it at least. And you may be interested to know that I got the idea of having an open house toolroom from a shop that's a lot bigger than ours."

"Is it a new experiment or has it been tried long enough to see how it works out, Al?"

"Been going something over ten years. And they still believe it pays."

Are toolcrib attendants necessary in a small shop? How important is an accurate inventory of small tools?

DISCUSSION

What About Vacations?

Some men do not want vacations because they figure that they have had enough time off with the regular holidays, and possibly from sickness or other causes beyond their control. Closing the plant for a week or two would force these men to take vacations they could not well afford. But if the management sees fit to close the plant for a week or two, there are generally enough repair jobs to keep the men busy who want to work.

If the plant is not to be closed, a good plan to follow would be to ascertain how many men want vacations and then to decide how many men in each department are to be off each week. After this decision has been made, an identical number of dated slips should be placed in a box, one to be drawn by each man, which will designate the week he is to be off. The men should then have the privilege of trading slips if they so desire. Such a plan would give every man a square deal and would satisfy all concerned. —W. J. Owens.

Some plants find it convenient to shut down and let all the men take their vacations at one time. In most plants, vacation time can be taken for inventory and for making repairs that cannot well be made while the plant is running, and work can generally be found for men who prefer to take their vacations at some other time.

A budget plan of vacation assignment can easily be arranged with but

little disruption of the production schedule. It permits giving the men a limited choice as to the time of taking their vacations. The men can be divided into three groups. The first group will begin its vacation, say, the second Monday in July, the vacation to last one week. The second group will begin its vacation two weeks later, leaving one week in between when the entire force will be on hand. The third group will begin its vacation two weeks later than the second group. This system allows individual employees a choice between the three periods and permits budgeting them in such manner as to prevent disruption of any one class of operators.

—JOHN E. HYLER.

There is often a marked division of opinion regarding the merits and demerits of the spread holiday period. The advantage to the company of a shut down for a week as against the drawn out inconvenience of a lengthy spell can scarcely be controverted. The management must decide whether it is better business to concentrate the holidays within three weeks, including the shut down as the middle period, or to spread them out over three months or so.

Married men not only have family responsibilities, but family preferences as well. If son John and daughter Mary can arrange to take their vacations together at a specified time, the father is keenly concerned in arranging his vacation to suit theirs. There is yet another reason why freedom of choice is preferred. It is a question of the family budget. The holiday scheduled in mid-August is one of highest prices and greatest congestion.

Unfortunately, in most instances we are up against not what is desirable, but what is practicable. A spread vacation period to operate throughout the entire plant may be so impracticable as to be outside the range of practical industrial application.

—N. WILLIAMS,
Stafford, England.

Yearly Wage

A yearly wage for the man in the shop would solve many of our social problems and would ease him of a considerable burden.

It could be worked out without a great deal of difficulty by taking departmental averages of payrolls for a period of, say, the preceding five years. This would result in a minimum figure to be paid to each employee weekly. At the end of the year, or possibly twice a year, or even quarterly, the relation of direct labor cost to sales for the current period could be figured, and after comparing it with the average for the past five years, the company could declare a bonus to the employees for the variation.

In the case of a plant making parts to customer specifications on a cost plus basis, if the labor cost is figured on the minimum wage rate, the selling price is low and unfair to the producer. But provision could always be made to add to the minimum labor cost the variation from the five-year average. Costing of orders could be worked out on the same basis and would not entail so many variations.

The element of labor in costs is variable, depending upon business conditions and local wage rates. With a minimum wage, costs could be easily figured at the minimum plus the variation.

—MAURICE H. BAITLER.
Perkins Machine & Gear Company.

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TRADE PUBLICATIONS

ARC WELDING. "Automatic Arc Welding by the Electronic Tornado," a 42-page booklet, announced by the Lincoln Electric Co., Cleveland, Ohio, gives a full explanation of the "Electronic Tornado" system of automatic carbon arc-welding, designed for use in industries where products of relatively uniform character are produced in large quantities.

BUILT-UP ROOFS. A booklet entitled "Facts about Built-Up Roofs" issued by Johns-Manville, 22 East 40th St., New York, N. Y., explains the "built-up" roof. The booklet is well illustrated, showing the materials and methods of construction.

CAMERA AND STEREOSCOPE. The Bausch & Lomb Optical Co., Rochester, N. Y., has published a circular containing specifications, description and price lists on its Ortho-Stereo Camera and Ortho-Stereoscope for three dimensional records at 1 to 24 diameters.

CARBIDE RESIDUE. The Linde Air Products Co., 30 East 42nd St., New York, N. Y., has available a 20-page booklet entitled "The Utility of Carbide Residue." It explains in detail how owners of acetylene generators may capitalize on their valuable residual byproduct.

CONTROLLERS. The Brown Instrument Co., Philadelphia, Pa., has published a catalog on Brown air-operated controllers for the control of temperature, pressure, flow and liquid level. This catalog is No. 3900.

COUPLINGS. A folder issued by the John Waldron Corp., New Brunswick, N. J., describes the cross-type coupling. A table of ratings and dimensions is included.

DRILLING MACHINES. The Foote-Burt Co., Cleveland, Ohio, has released a bulletin presenting its line of drilling, tapping, boring and broaching machines and units.

ELECTRO-PLATING FILTERS. Bulletin No. 103 put out by T. Shriver & Co., 810 Hamilton St., Harrison, N. J., describes uses of Shriver filters for electroplating.

GEAR LAPPING. "Correct Lapping" a folder put out by the National Broach & Machine Co., Shoemaker & St. Jean Sts., Detroit, Mich., explains the method employed by the "Red Ring" machine in the lapping of all plain and helical spur gears.

GEAR MOTORS. The Diehl Manufacturing Co., Elizabethport, N. J., has published a folder, Form No. 1870, on gear motors. Specifications and price lists are included.

METAL BANDSAW. Bulletin No. 800A, compiled by the Armstrong-Blum Manufacturing Co., 333-357 N. Francisco Ave., Chicago, Ill., introduces its Marvel metal bandsaw, No. 8. Line drawings illustrate the types of work the machine will do.

METAL SAWING MACHINE. The Peerless Machine Co., Racine, Wis., announces a circular presenting its improved high duty metal sawing machine.

SOCIAL SECURITY ACT. "Your Questions Answered" presents the essential facts of the Social Security Act, simplified and clarified by Glenn L. Gardiner of the Forstmann Woolen Co., Passaic, N. J. This pamphlet is in question and answer form, suitable for distribution to employees. Prices for quantity shipments of this pamphlet may be obtained from the Elliott Serv-

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ice Co., 242-250 West 55th St., New York, N. Y.

SPECIAL MACHINERY. A folder put out by the Kent-Owens Machine Co., 958 Wall St., Toledo, Ohio, shows "What You Would See If You Went Through The Plant." Photographs illustrate various set-ups in the production of special machinery.

TESTING MACHINES. Bulletin 12, issued by the Tinius Olsen Testing Machine Co., 500 North Twelfth St., Philadelphia, Pa., describes the construction and operation of the Frocht straining machine for photoelastic research.

"TEXROPE" DRIVES. Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has released a 32-page bulletin No. 1259 on Texrope drives for machine tools.

THERMOSTATIC BI-METALS. A comprehensive review of specifications, properties and methods of application of modern thermostatic bi-metals is assembled for convenient reference in the latest "Blue Book of Thermometals," published by the H. A. Wilson Co., Newark, N. J.

THREADING MACHINES. "Let's Talk About Performance," a folder compiled by the Landis Machine Co., Inc., Waynesboro, Pa., presents its line of threading machines, dieheads and collapsible taps.

TIME SWITCHES. Publication GEA-1427D, put out by the General Electric Co., Schenectady, N. Y., presents the company's general-purpose automatic time switches.

TUBE FABRICATING EQUIPMENT. The Parker Appliance Co., Cleveland, Ohio, has published Bulletin No. 40 presenting its line of tube bending machines and accessories. Price lists are included.

TURRET LATHES. The Foster Machine Co., Elkhart, Ind., has announced a folder on the features of design and construction of its 1½-in. "Motor-in-the-Base" universal turret lathe.

VALVES. The Hancock Valve Division of Consolidated Ashcroft Hancock Co., Inc., Bridgeport, Conn., has issued two bulletins describing its latest contribution in the valve line. One describes the Hancock Flocontrol valve, a manually operated valve with a straight line flow characteristic, and the other gives all details on the Hancock union bonnett bronze valve.

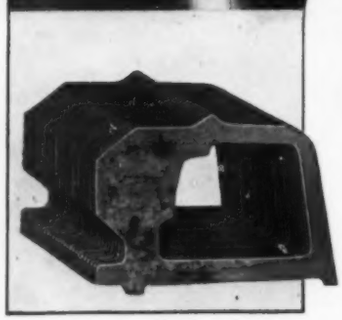
WIRE PRODUCTS. The Republic Steel Corp., Massillon, Ohio, has published a 40-page booklet which contains information on wire and wire nails.

WOOD SCREW ANCHORS. Bulletin U-100, giving data on "Rawlplugs" as wood screw anchors, has been issued by the Rawlplug Co., Inc., 98 Lafayette St., New York, N. Y.

WORLD MACHINERY STATISTICS. Trade Information Bulletin No. 825, "Industrial Machinery in Principal Foreign Countries," has been released by the Bureau of Foreign & Domestic Commerce. This pamphlet gives in concise form basic information concerning machinery production and trade in seven foreign countries that are among our best customers for industrial machinery. Copies may be obtained from the Superintendent of Documents, Washington, D. C. Price 10 cents.

WRENCHES. The Bonney Forge & Tool Works, Allentown, Pa., has issued a 47-page catalog, No. 35, presenting its line of wrenches. Six pages are devoted to special wrenches for automotive and aircraft applications.

Side plates for paper box machine.



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